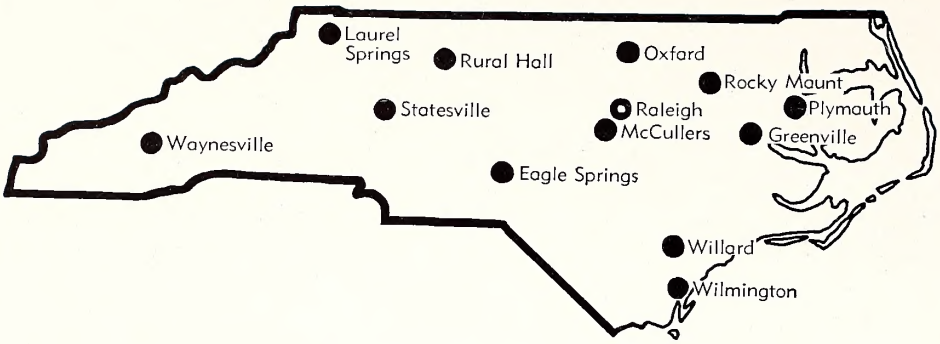
RESEARCH and FARMING

1948 Seventy-First Annual Report

North Carolina Agricultural Experiment Station



Raleigh—North Carolina State College and Central Experiment Station

Plymouth—Tidewater Branch Station

Willard—Lower Coastal Plain Branch Station

Wilmington—Vegetable Research Laboratory

Rocky Mount—Upper Coastal Plain Branch Station

Greenville—Coastal Plain Tobacco Research Farm

McCullers—McCullers Branch Station

Oxford—Tobacco Branch Station

Eagle Springs—Peach Research Laboratory

Statesville—Piedmont Branch Experiment Station

Rural Hall—Upper Piedmont Tobacco Research Farm

Laurel Springs—Upper Mountain Branch Station

Waynesville—Mountain Branch Station

ON THE COVER: The microscope has proven a valuable aid in studying the internal structure and texture of ice cream. The ice cream shown in this microscopic enlargement was frozen on a continuous freezer. The air cells (large white splotches) are uniform in size and evenly distributed through the ice crystals and unfrozen matrix (surrounding dark area).

RESEARCH and FARMING

1948

SEVENTY-FIRST ANNUAL REPORT
Agricultural Experiment Station, North Carolina State College of Agriculture and Engineering of the University of North Carolina. Fiscal Period of July 1, 1947 to June 30, 1948. Progress Report for December 1, 1947 to November 30, 1948; North Carolina Department of Agriculture cooperating.

North Carolina State College of Agriculture and Engineering
of the
University of North Carolina
Raleigh

OFFICE OF DEAN AND DIRECTOR

SCHOOL OF
AGRICULTURAL AND FORESTRY
RESEARCH EXTENSION
RESIDENT TEACHING
AGRICULTURAL EXPERIMENT STATION

To. The Governor of North Carolina
The Board of Trustees and President of the University of North Carolina
The Chancellor of North Carolina State College of Agriculture and Engineering

I am transmitting herewith the report of the Agricultural Experiment Station for the year ending June 30, 1948.

Respectfully Submitted

J. H. Hilton

J. H. Hilton, Director

IN THIS ISSUE

Research and Farming

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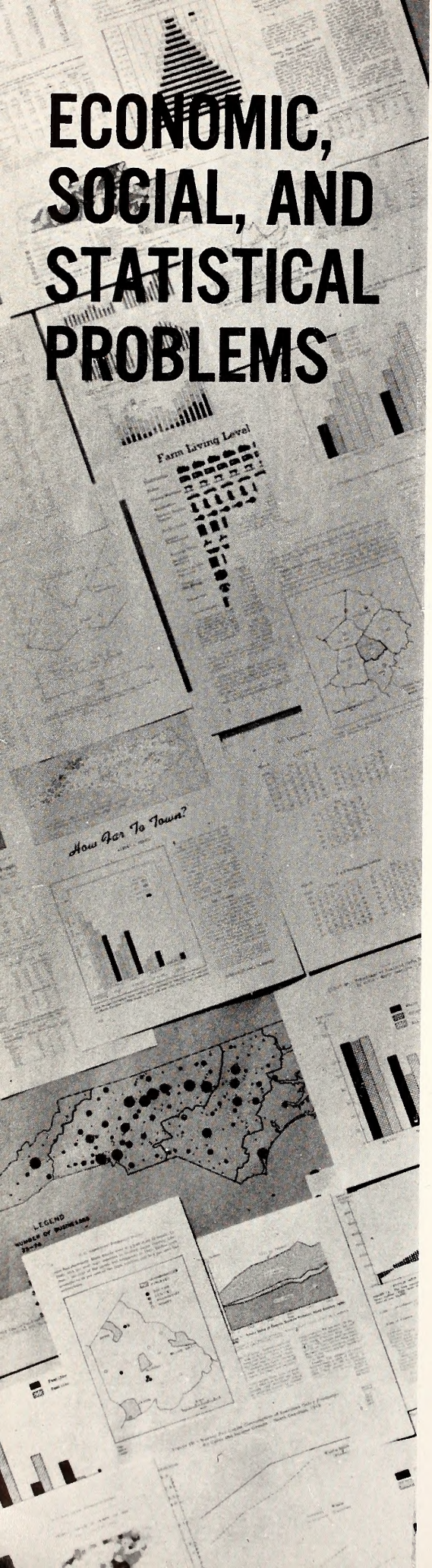


AGRICULTURAL ECONOMICS

TRACTORS PAY ON SMALL FARMS

It is now economical to mechanize farms with as little as 35 acres of cropland. In a study of tractor and workstock farms in the Northern Tidewater area, H. B. James found that it is economical to mechanize at the point where the second mule is required to operate the farm.

The per acre cost of producing crops on a 35-acre corn-soybean-Irish potato farm was $60 with mule power but only $54 with tractor power. On larger farms the per acre cost was lower for both workstock and tractors. There was relatively more economy in the use of tractors as the size of farm increased.

Some of the reasons why tractors can be used more economically on small farms than ever before are: (1) the development of more efficient small tractors; (2) an increase in farm wage rates; and (3) higher prices for feed and other crops the farmer produces.

Mechanization Depends on Crop

The size of farm at which it is profitable to mechanize depends upon the crops grown, number of workstock displaced, total amount of work available for the tractor including custom work, and the relative prices of gas, oil, equipment, feed, labor, and crops produced for sale. James says it usually will not pay to mechanize if farmers retain the same number of horses and mules after buying the tractor. Neither will it pay if the amount of work available is not greater than can be handled by one mule. When farm wages are high, tractor power has increased economic advantage because mechanized crop production requires less labor.

Some crops are more adaptable to mechanized conditions than others. For example, in the northern Tidewater labor requirements in producing soybeans for hay were reduced most by the use of mechanized methods. Following in order were soybeans for beans, wheat, corn, lespedeza hay, cotton, Irish potatoes, and tobacco.

Mechanization Changes

Some of the farming changes associated with mechanization are:

Mechanization increases the flexibility of the farming system.

New crop and livestock enterprises may be added to the farming system where tractor power is available. For example, it may be profitable to add or increase such crops as small grain and soybeans since they are well suited to mechanization. Feed released by reducing workstock may be sold as grain and hay or marketed through productive livestock. Labor released by the addition of tractors may be used for producing other intensive enterprises or employed off the farm.

Larger farms are needed for the most efficient use of machinery.

Mechanized farms in the northern Tidewater area are about three and one-half times as large as workstock farms.

Fewer farm workers are needed where farming operations are mechanized.

Labor Requirements

Labor requirements usually can be reduced from 40 to 60 per cent by mechanizing, depending on the crops and livestock grown.

Mechanization favors timeliness of operations.

The ability of the tractor farmer to accomplish more work in a shorter period of time and to operate at night makes it possible to perform more farm operations at or near the optimum time.

Mechanization reduces cost of production.

On farms large enough to utilize modern equipment efficiently, crops can be produced cheaper with tractor power.

Mechanization increases the responsibility of management.

The use of tractors and complementary equipment requires more skilled management for the adjustment, repair, and operation of the equipment. The larger investment in operating capital and the larger cash outlay necessary to operate the farm business increase the responsibility of management.

Intensify Practices on Small Farms

Farmers in the southern Piedmont area of North Carolina are often limited in their choice of farming enterprises by a lack of land adapted to crops and pasture production.

On the basis of a study currently under way, W. W. McPherson, W. H. Pierce and R. E. L. Greene recommend more intense cultivation where land is the limiting factor than where the farm is larger and labor is relatively more scarce.

An Example

This problem is illustrated by two examples from the southern Piedmont study.

On a farm with 37 acres of cropland and seven acres of permanent pasture, the most profitable combination of cash enterprises appears to be eight acres of cotton, two dairy cows and a flock of 200 hens. The cotton acreage is the maximum consistent with long-term soil conservation. Livestock are limited to that for which forage and most of the grain can be produced on the farm.

Alternative opportunities for this farm are limited. If the acreage of cotton is devoted to production of feed, it would be possible to add only 200 laying hens. But this adjustment under 1945 prices would reduce net cash income about $340. The price of cotton would have to drop to about 16 cents with egg prices of 40.4 cents per dozen before egg production could profitably replace cotton on a farm of this size.

Dairying Replaces Cotton

Milk cows might be added in place of cotton. Additional pasture, however, would mean a reduction in cropland. A substitution of this kind would reduce net cash income by $796. To make it profitable, cotton prices would have to drop to about 7.5 cents per pound with milk at 1945 prices or above.

Larger farms with 75 acres or more of cropland offer more flexible opportunities for adjustments. This is especially true on one-family farms. On farms of this size, dairy, poultry and small grain-lespedeza enterprises offer opportunities for profitably supplementing and/or replacing income from cotton.

The net returns per acre from these products are less than from cotton, but where enough land is available and labor is relatively scarce, there is the advantage that a family can tend a much larger acreage of these compared with cotton.

Increases Income

A farm with 122 acres suited to crop and/or pasture and an additional 23 acres adapted to permanent pasture will serve as an example. A system with 16 acres of cotton, feed to support 20 dairy cows, and the remainder of the farm in small grain would yield a gross income of $12,390 and a family net income of $3,979. If the enterprise combination is changed to a two-man system of dairy-small grain, the gross income would be reduced to $10,158, but the greater reduction in labor would leave a net income of $5,442 to the farmer's family.

This is about 37 per cent greater than the comparable income of the more intensive cotton-dairy system.

Do Farm Plans Pay Off?

Do farmers follow long-time agricultural programs developed with their help? If so, how fast do they move toward the objectives which they adopted, and what are the results?

These are among the questions which T. K. Jones and H. B. James hope to answer when they complete a study of changes in farm organization and management which have occurred on farms in Clay County, North Carolina.

In 1946 farms in the county were divided into size and type groups, and a farm plan worked out for a farm representative of each group. Blanket recommendations to all farmers in the county were replaced by more specific recommendations based on the farm plans. This procedure resulted in a long-time farm program better adapted to the needs of the people and to the agricultural resources of the county.

Besides determining progress made toward adoption of this program, Jones and James seek suggestions for improving techniques currently used in developing long-time county programs.

North Carolina Joins in Bangs Survey

In cooperation with the Bureau of Agricultural Economics Frances E. McVay and A. L. Finkner made a study of the factors influencing the effectiveness of the present control programs in the eradication of Bang's disease from cattle.

The records now maintained by the Bureau of Animal Industry in ten selected states were sampled and used as a basis for analysis. Data from Minnesota, Michigan and Pennsylvania indicate that where the area plan of testing is employed, the disease is most prevalent in herds not previously infected. About one-half of the infected herds whose records were examined were cleaned up in the first test and during the first three months of control.

The average infection rate for the United States decreased from the beginning of the control program in 1934 until 1940. During the war years, when personnel and supplies were at a premium, infection rates began to climb. Only in 1947 did rates begin to show a downward trend.

Peaks of infection by region were clearly demonstrated when monthly infection rates were considered. It appeared that in the New England States, the peak infection came in August. Further south, the peak came earlier.

It does not appear from existing data that it will be possible to predict with reasonable accuracy the length of time necessary, the number of tests required nor the number of animals that must be eliminated in order to rid a herd of Bang's disease.

BE SURE OF YOUR FARMING INFORMATION

For certain types of new farming practices, farmers may obtain more of their information from such informal sources as neighbors, relatives and dealers than from the county agent and other agricultural leaders. Furthermore, the use of these sources may lead to incomplete information, resulting in the farmers' dissatisfaction with improved practices.

These are two of the significant findings in a study of improved farming practices conducted by Eugene A. Wilkening in an Upper Piedmont community.

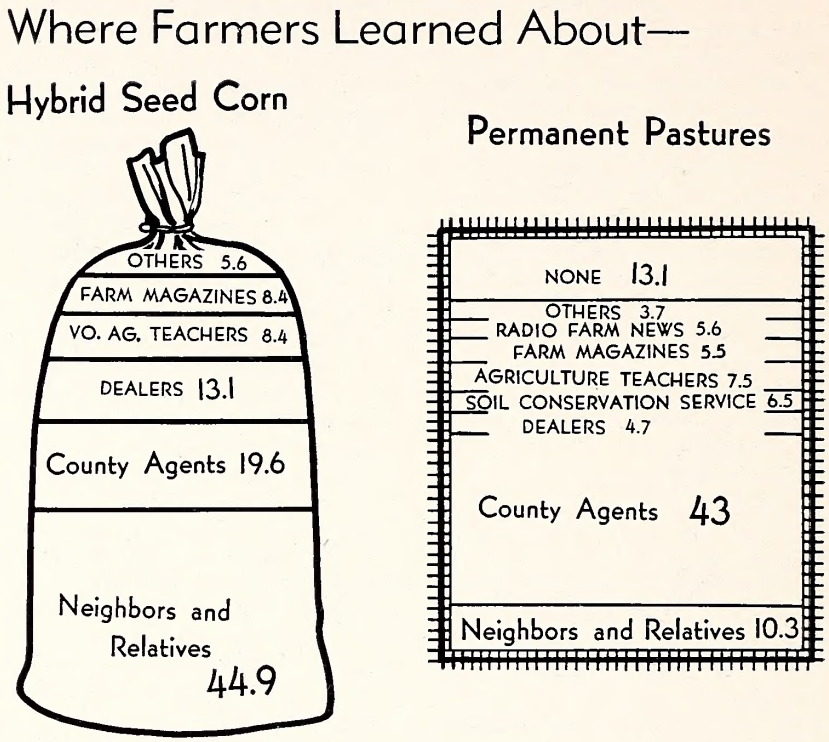
Hybrid seed corn and improved permanent pastures were two of the practices used in the study. Of the 107 farmers questioned, all except two had received information about hybrid seed corn. All except fourteen (about 13 per cent) had received information about permanent pastures. About an equal number had adopted the practices at some time.

As for the source of information, a high proportion of the farmers had obtained their information about hybrid seed corn from informal sources. Over half (58 per cent) gave such sources for hybrid seed corn as compared with 15 per cent for information on pastures. More than twice as many farmers obtained their information on hybrid corn from neighbors and neighbors and relatives than from the county agent.

At the time of the study, there was evidence that a much higher proportion of the farmers were "sold" on permanent pastures than were sold on hybrid seed corn. There was no one who had seeded permanent pastures that was completely dissatisfied with the practice. Of the 70 farmers who had planted hybrid seed corn at one time, close to a third were dissatisfied with it. They said that it would not yield as well as regular corn—that the cob was too large or that it had some other weakness. Much of the dissatisfaction, it was discovered, resulted from the use of unadapted hybrid seed.

The important point is the relationship between dissatisfaction and the source of information. Almost two-thirds of the farmers who had obtained their information on hybrid seed corn from neighbors were dissatisfied with it for some reason or other. Only one-fourth of those who had obtained their information from the county agent or the vocational teacher were dissatisfied.

Of those who had obtained their information primarily from dealers, about half were satisfied and half were dissatisfied. The implication is that those who sought the advice of their county agent or vocational agriculture teacher obtained more accurate and complete information on the proper strains of hybrid corn to grow, and the fertilizing and cultivation to follow for maximum results.



Almost half (44.9 per cent) of the farmers in this survey said friends and neighbors were their main source of information on hybrid corn. About the same proportion first learned of permanent pastures from county agents.

FOOD LOCKER INDUSTRY GROWS

Eighty-nine of the 100 frozen food locker plants active in North Carolina in 1948 started business operations during the last four years. This is among the findings of Martin Abrahamsen and George Capel in a study of the frozen food locker industry.

Information as to growth, organizational structure, operating practices, income and expenses was obtained from 77 plants. It was based on personal interviews with 39 plant managers and mail questionnaires from 38 plants. Some of the other significant findings are:

1. About three-fourths of all lockers are rented to farmers.
2. A majority of the managers have had little difficulty in renting lockers.
3. Plants in operation more than one year had an average of about 95 per cent of their available space rented.
4. About two-thirds of this number were rented to within 99 per cent of capacity.

Rural Isolation Boosts Medical Costs

In a sample survey of 500 rural families of eastern North Carolina, C. Horace Hamilton and staff of the Department of Rural Sociology found that 27 per cent of the families lived more than 10 miles from a doctor and more than 20 miles from a hospital.

The families living at these distances from doctors and hospitals had about the same amount of illness as other families. The survey also showed that they use hospitals and doctors to about the same extent. However, there were two important differences: (1) The isolated families did not and frequently could not get medical service in their homes; and (2) if they did get a doctor to make the trip, the expense was greater.

Night Calls Higher

The cost of getting a doctor in the country varied with the distance the patient lived from town. The average fee for one call at the doctor's office was found to be $2.80. The average fee for a home call in the day was $7.12, and for a home call at night, $9.35. On the average, the cost of a call to a patient's home at night was 31 per cent greater than a daytime call at the same distance.

On the average the cost of a home call in the country started at $2.55 for no distance and increased at the rate of $.66 for each mile the rural family lived from the doctor. This relationship may be tabled as follows:

Cost of Doctor's Visit to Patient's Home by Miles Traveled

Miles Traveled	Average Cost
0	$ 2.55
5	5.85
10	9.25
15	12.45
20	15.75
25	19.05

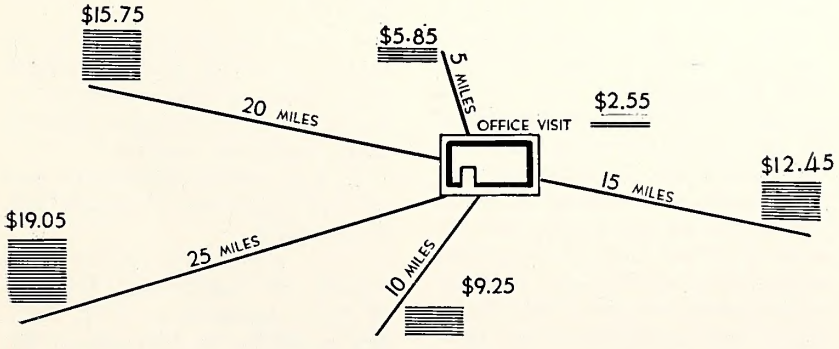
The initial cost of $2.55 for a home visit with no miles traveled was about the same as the charge for an office visit.

Few Night Calls Result

As a result of the high cost of home calls, especially at night, there are very few such calls. Also there is an increasing tendency for doctors to ask patients to come to their office or to the hospital. This not only saves the doctor's time but also makes it possible to use laboratory and X-ray equipment which cannot be taken into the country.

Added to this trend in medical service is the fact that more doctors are leaving the small country towns and are locating at centers large enough for hospitals. In view of this trend, the development of a rural ambulance service and good rural roads become even more necessary.

Doctor Travels—Patient Pays



It costs extra for home calls. Families in eastern North Carolina find their bills increased at the rate of $.66 for each mile they live from the doctor.

Organizations Help Adult Participants

Participation in organizations is important in the development of a well-balanced personality. Nearly everyone recognizes the importance of such participation for children and young people. It is probably just as important for adults.

Selz C. Mayo is working on a study to determine to what extent rural people participate in community organizations. The measure of participation being used is the membership of the head of rural households in organizations.

Study in Wake County

Three community situations in Wake County were selected to offer variations in organization membership. Community A consists of an open country area. It has few organizations and perhaps can best be described by the term "low degree of community consciousness."

The second community situation is an open country area consisting of 197 families surrounding a small incorporated village. The village itself, which was made up of 121 families, is the third situation under study. For purposes of analysis, the open country area is designated as Community B and the village as Community C. This situation was selected because it represented an area of a high degree of community consciousness, with several organizations in the village.

Three-Fourths Are Church Members

In Community A, 75.2 per cent of the heads of households were church members. The proportion of church members increased to 83.2 per cent in Community B and was highest (88.4 per cent) in the village. In Communities A and B, the agricultural population were church members to a much greater extent than the non-agricultural population.

In both Communities A and B, the heads of Negro households maintained church membership to a much greater extent than the white heads of households. In Community A, 97.4 per cent of the Negro heads were church members as compared with 64.1 per cent of the white. In Community B, 88.3 per cent of the Negro heads were

(Continued on next page)

Third of Rural People Do Not Farm

Nearly a third of the heads of rural households in eastern North Carolina were engaged in nonagricultural pursuits when surveyed in the summer of 1947 by C. Horace Hamilton and Selz C. Mayo.

Hamilton and Mayo found that this nonagricultural group comprised 27.5 per cent of the households that owned some land. They owned 18.3 per cent of all the land owned by families in rural areas.

The other part of the rural population—those engaged in agricultural pursuits—farm owners, tenants, sharecroppers, farm wage workers—made up 68.4 per cent of the heads of the households. They comprised 72.5 per cent of the households owning some land, and they owned 81.7 per cent of the land.

White families made up 63.4 per cent of the population in eastern North Carolina. They comprised 73 per cent of those who owned some land. At the same time, the white population owned 89.1 per cent of the land owned by families living in rural areas. Nonwhites made up 36.6 per cent of the rural households, comprised 27 per cent of the households owning some land, but actually owned only 10.9 per cent of the land owned by rural families.

More than half (51.9 per cent) of the white-collar workers owned land. These were not small tracts, since they averaged 99 acres. More than one out of five (21.2 per cent) of the farm tenants owned land, the tracts averaging 16.4 acres. Of the sharecroppers, 6.8 per cent owned land, these tracts averaging 23 acres. Most surprising of all is the fact that 11.1 per cent of the farm wage workers owned land. The average of these tracts was 56 acres.

A larger proportion of the nonagricultural groups owned land in rural areas than did the three agricultural groups cited—tenants, sharecroppers and farm laborers. About two in five (39.2 per cent) of the nonagricultural laborers owned land. They owned, on the average, 28.6 acres. The study excluded land owned by corporations, insurance companies and by people who lived in urban centers.

Hamilton and Mayo conclude that these trends toward (1) an increasing proportion of the rural population not engaged directly in agriculture; and (2) an increase in rural land ownership among nonagricultural households are among the most significant in recent decades. In other words, they say, agriculture is being conducted by fewer and fewer people and by a smaller and smaller proportion of the rural population.

Participation in Rural Organizations

(Continued from Page 7)

church members as compared with 80 per cent of the white. (There are only two Negro families in the village.)

PTA Membership

Membership in the Parent Teachers' Association showed no such pattern. In fact, considering all the families in each of the three communities, the proportion holding membership in the PTA was highest in Community A, decreased in B, and was lowest in the village.

The agricultural heads in both Communities A and B held membership in the PTA to a greater extent than the nonagricultural heads. A larger proportion of the Negro heads in both were members of the PTA than white. In Community A none of the heads of white agricultural households maintained membership in this organization. Actually, PTA plays a very small part in the lives of these rural people, particularly in the case of the white heads of households.

In Community A, none of the heads of households were members of the major farm organizations. In Community B, 21.3 per cent were members of either the Farm Bureau or the Grange. In the village, 18.2 per cent of the heads were members of one of these organizations. A few of the Negro heads were members of the farm organizations but they actually take no part in the organization other than holding membership.

Sampling Cuts Work On Survey Problems

Several sampling plans for surveys in other research departments have been set up by R. L. Anderson, A. L. Finkner and Emil Jebe.

Any study involving a large number of plants, farms, people, etc., would require tremendous amounts of money and time if each individual were studied. The best shortcut is to take a sample, making it as representative as possible. There would always be a difference between the results from a sample and those from a complete listing of the population. The statisticians attempt to make this difference as small as possible. They attempt to design each survey so that it will contribute something to the knowledge of how to improve future surveys.

Sampling Surveys

Below is listed several of the surveys for which Anderson, Finkner and Jebe have helped draw the sampling plans:

1. A survey of farm women's and municipal produce markets in North Carolina. The markets in nine cities of the state were studied. Buyers and sellers in these markets, in addition to about one per cent of the families in each city, were interviewed.

2. A survey of the State's frozen food industry. Personal interviews were held at about one-third of the 96 plants in North Carolina.

3. Volume and disposition of milk handled by Grade A milk producer - distributors. Questionnaires were mailed to 235 such groups, and only 14 failed to respond with the desired information.

4. A direct enumeration of establishments was used to estimate the amounts of dairy products used per week by restaurants, grocery stores and soda fountains.

5. A household enumeration was used to obtain data on family milk consumption.

6. A survey was designed to "Study the Educational Interests of Farm Operators in North Carolina as related to Agricultural Extension Work." The master sample areas, units consisting of six to

(Continued on next page)

STATISTICS—KEY TO AGRICULTURAL RESEARCH

The average layman sometimes is led to believe that scientific progress results from accidental discoveries, from chance observations—perhaps even from laboratory mishaps.

Such a conception is far from the truth. To be sure, an element of chance is usually involved. But the great majority of significant scientific advancements, both in the past and in modern times, have come only after long, careful and systematic study.

There Are Bad Experiments

Early in this modern "Age of Experimentation," researchers learned that there is such a thing as a bad experiment . . . that good experiments take planning. To aid in this planning there arose a new branch of science known as Applied Statistics.

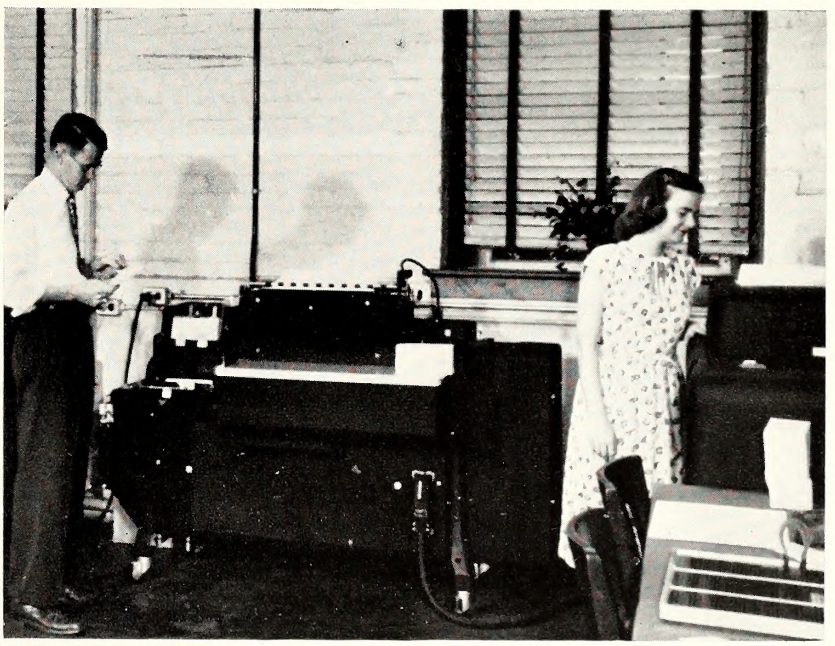
In effect, experimental statistics is research in how to do research—experimentation with different patterns and methods of conducting experiments. Hence, it is of little practical concern to the farmer or to anyone else except those doing research.

Consulting and Computotionol Service

One of the major functions of the Department of Experimental Statistics is the consulting and computing service it renders research workers in other departments of the Experiment Station. In helping to plan the experiments and through the analysis of data, the statisticians aid in obtaining maximum information and accuracy from the results. Most of the results given in this and other reports of the Station come from well-designed experiments, analysed according to the best known statistical methods.

To aid in analyzing large masses of data, the computing facilities of the Department have been expanded this year to include all of the important machines manufactured by the International Business Machine Corporation.

North Carolina has what is probably one of the nation's most modern statistical laboratories. Many important research jobs that have been beyond the scope of limited budgets and personnel because of time required for computation, are now easily managed by these new machines.



The mochines shown here in operation are port of the equipment that makes up the computing sectian of the Stotistics Department. The Department now has all important machines mode by Internotional Business Machine Corparotion.

Sample Surveys

(Continued from page 8)

eight farm operators each, were used in conducting this survey. Assistant county agents, acting as enumerators, did an excellent job of obtaining the facts requested on the questionnaires.

Costly Port of Surveys

The most costly part of a survey is obtaining answers to the questionnaires. Much work needs to be done to improve the response to mailed questionnaires, since the mail questionnaire represents a great saving in time and expense over personal interviews. This is particularly important now, because the data on prices which farmers pay and receive, used in forming parity indexes, are obtained mainly by mailed responses.

DETERMINE PLOT SIZE FOR EXPERIMENTS

What size plot is the most efficient and economical for conducting experiments? To find the answer to this question, studies were made on two different crops.

In the case of peanuts, J. A. Rigney and H. F. Robinson found that, in general, a large number of small plots is most efficient if only a few inexpensive measurements are to be taken on each plot. If the measurements on each plot are many and expensive, a few large plots are best.

A problem with clover has been how to draw samples for making chemical laboratory determinations. J. A. Rigney and R. E. Blaser worked out a mathematical method for determining the number of samples needed, depending upon the laboratory technique.

In this particular study, they found that one laboratory determination on a composite from two or three "representative samples" from each treatment plot was the most economical. Where the laboratory technique was not as accurate as in this study, more determinations will have to be made per field sample.

Alfalfa Needs Potash Annually

Annual applications of potash have resulted in more efficient use of this material than heavier rates applied every other year, according to W. W. Woodhouse, Jr., and D. S. Chamblee who are conducting top dressing experiments.

The effect of the large, less frequent applications on test plots had worn off by the second year. The yield of hay was no lower, but the potash content fell dangerously close to that of the "no potash" treatment on which the yield was declining.

These findings are in contrast with those concerning phosphate fertilization of alfalfa. The difference is important, since the two materials are normally applied at the same time. If the grower applies a two-year supply of phosphate at one time the crop will usually be well taken care of both seasons. On the other hand, the application of a two-year dosage of potash may leave the crop suffering for this element the second year.

Yields from these experiments also emphasized the necessity of potash fertilization for alfalfa. Five of seven experiments conducted on farmers' fields in Haywood, Moore, Chatham and Wake Counties showed yield increases from potash. This was in spite of the fact that all fields had received normal potash applications up to the time the experiments were started.

In other words, leaving off the potash, even on fields that have been well fertilized, has usually resulted in losses in both stand and yield by the second season. Reductions in stand actually are more serious than yield losses since they are followed by an increase in weeds and a consequent lowering of forage quality.

INSECTS MAY CAUSE "POOR" ALFALFA

Insects are undoubtedly responsible for much of the unthrifty, short and distinctly yellow alfalfa often found in North Carolina during the late summer, say W. M. Kulash and C. H. Hanson. Lack of moisture, mineral deficiencies and diseases may cause similar symptoms, Kulash and Hanson add.

The poor and unthrifty fields examined by the two investigators in the fall of 1947 invariably had a high population of at least three of the more common alfalfa insects. In contrast, green, thrifty fields were relatively free of insects.

The insects most commonly found were the three-cornered alfalfa hopper, the potato leaf-hopper, the spotted cucumber beetle, and the pea aphid. In addition, grasshoppers as well as several species of caterpillars were found. The caterpillars were the green clover worm, the fall armyworm, and a few other species not identified at the time collections were made. Some fields were completely destroyed by fall armyworms during 1947 and 1948.

The most conspicuous type of damage is that caused by the defoliating insects such as the fall armyworm. The armyworm is a heavy feeder on green foliage, and when present in large numbers, it will strip a field clean.

A 5 per cent DDT dust at 20 to 25 pounds per acre will help reduce the numbers of late-season attackers, with the possible exception of the three-cornered alfalfa hopper. This bug may be controlled with a dusting of 3 per cent gamma benzene hexachloride, or a combination of DDT and BHC. Forage treated with these insecticides should not be fed to or pastured by dairy animals or animals being finished for slaughter.

For control of armyworms, Kulash recommends use of 10 per cent methoxychlor dust at the rate of 15 pounds per acre. DDT will also control armyworms, but it denies the use of the alfalfa as feed for dairy or meat animals.

FORCED AIR DRYING PERMITS QUICK BALING

Alfalfa and lespedeza hay usually can be baled after four to six hours of field curing, J. W. Weaver, Jr., C. D. Grinnells and S. H. Usry have found. The bales are placed under shelter where drying is completed with forced air.

First Cutting Most Difficult

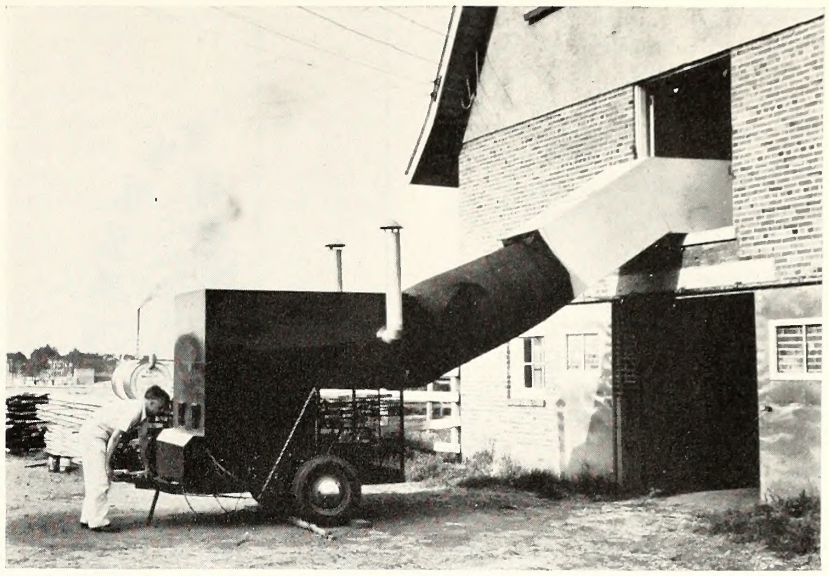
For best results, the moisture content of the baled hay should not be more than 40 per cent (wet basis) when placed on the dryer. The first cutting of alfalfa is the most difficult to dry. Frequently it must be left in the field to cure part of the second day after cutting before it can be baled.

The baler should be adjusted to make bales as loose as possible and still permit handling without coming apart.

Boles Should be Uniform

For most successful drying, the bales should be uniform in weight and size. This uniformity is hard to obtain regardless of the type of baler used. More uniform bales will result if the rate of cutting the hay is as fast or faster than the rate of raking and baling. First-cut hay should be raked and baled first.

The standard barn hay dryer with tapered air duct down the middle has not been found satisfactory for drying baled hay. An air duct down the side of the barn with a flat-slatted floor covering the rest of the barn is believed to be more satisfactory. A portable dryer can be used with such a system. Preliminary studies indicate that for many farmers it will be more economical to install a stationary dryer with a building designed for drying all crops grown on the farm.



This portable dryer successfully completed the drying of hoy thot hod been boled after only six hours of field curing. The standord born hoy dryer with tapered oir duct down the middle hos not been found sotisfoctory for drying boled hoy.

Agronomists "Go Underground" for Root Study

Over half of most plants (the root system) is hidden from view. Much less is known about this underground portion than is known about the above-ground portion. Yet all farming operations—fertilization, liming, plowing, and irrigation—are practices which attempt to influence plant growth through the root system.

D. S. Chamblee and R. L. Lovvorn believe they have reached the point where they must "go underground" to determine which forms of these practices are best and why. In their studies so far they have noted a striking difference in the penetration of alfalfa roots on sandy soils as compared to clay soils.

The alfalfa roots studied were dug ten months after planting. Roots growing on a Norfolk sandy loam commonly penetrated to 60 inches, while 30 inches was the general depths of penetration on a Cecil clay loam. Studies on similar soils show that the penetration of alfalfa roots on six-year-old stands was only slightly greater than that on the ten-month-old stands.

Another experiment has been designed on a Cecil sandy clay loam to evaluate some of the relationships between grass and alfalfa roots when these two types of plants are grown together. The root systems of the two plants are quite different. Grass roots take the form of a very dense mat in the upper ten inches of the soil with few roots extending down to 30 inches.

Though alfalfa roots utilize the upper ten inches of the soil, they also utilize very effectively the deeper areas. This deeper root system makes alfalfa less susceptible to drought and more efficient in absorbing nutrients from the soil.

ATLANTIC YIELDS MOST IN ALFALFA TESTS

Atlantic alfalfa yielded 12 to 24 per cent more hay than Kansas Common in three recent strain tests conducted in the Piedmont and Coastal Plain areas of North Carolina by C. H. Hanson. This vigorous variety, developed at the New Jersey Agricultural Experiment Station, is better adapted to the Eastern States than most commercial varieties of alfalfa.

Seed production of Atlantic is underway in the West. However, the acreage in seed production is still very small, and no seed is available on the market as yet.

More than 200 strains and experimental lots of alfalfa have been studied in the recent tests.

PHOSPHATE ON ALFALFA LASTS SEVERAL YEARS

Phosphate applied at the time alfalfa is established has proved to be effective for several years, in studies by W. W. Woodhouse, Jr., and D. S. Chamblee. The accompanying graph shows the effect of phosphorus, applied at planting, on the phosphorus content of alfalfa.

Apply Large Amounts at Seeding

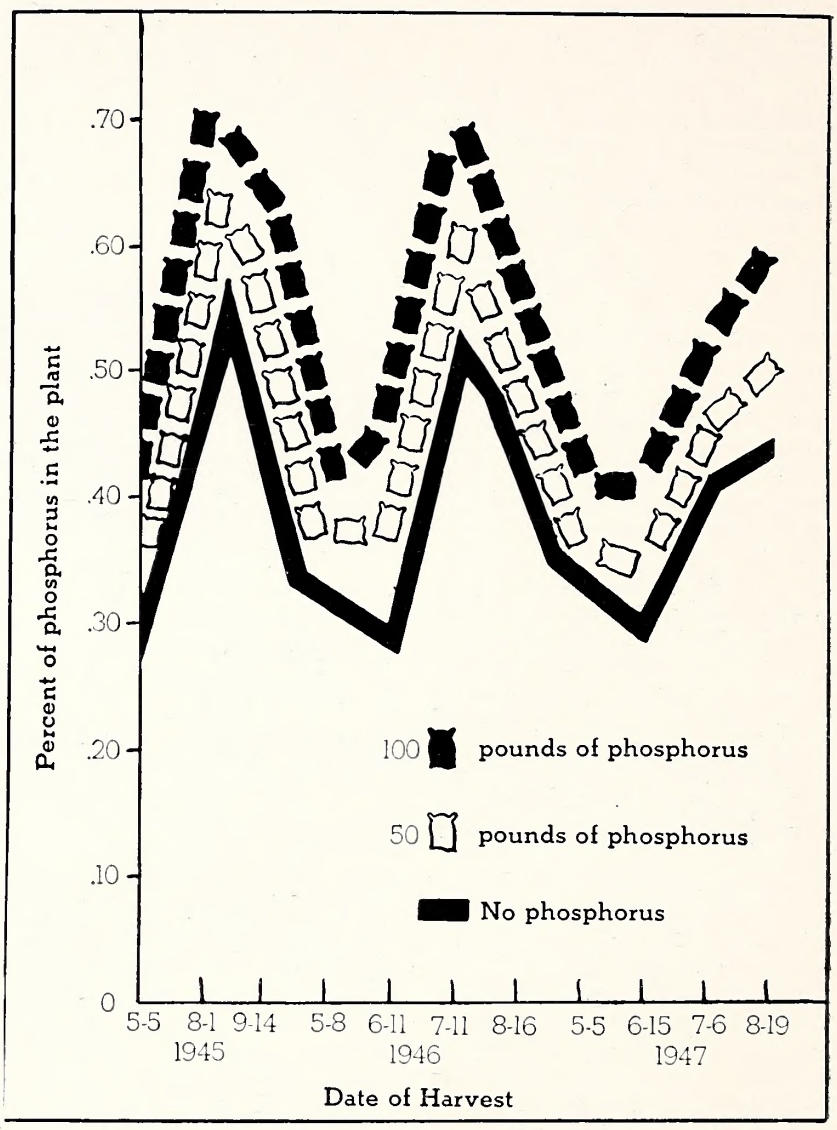
Actually, 100 pounds P_2O_5 applied in August 1944 affected the phosphorus content of the alfalfa plant to as large a degree in August, 1947 as it did the first year. These results further support the practice of putting down fairly large amounts of this material for alfalfa at seeding.

It can be seen from the graph that the level of phosphorus in the alfalfa on the "no phosphorus" and 50-pound treatments started down after the first season. The level under the 100-pound rate held up fairly well through two seasons but was definitely down during the third year. Thus, on this soil, 100 pounds of P_2O_5 at planting seemed to be about adequate for two years. Either a heavier initial application or a top dressing was needed to maintain the supply through the third season.

Present Recommendations

The present recommendations for alfalfa in North Carolina call for 700 to 1000 pounds of 2-12-12 (which supplies 84 to 120 pounds P_2O_5) at planting plus annual application after the first year of 400 to 600 pounds of 0-14-14 or 0-10-20 (supplying 40 to 72 pounds P_2O_5). An alternate recommendation calls for 1000 pounds of 18 or 20 per cent superphosphate plus 500 pounds of 2-12-12 (supplying 240 to 260 pounds P_2O_5) at planting, followed by 400 to 600 pounds 0-9-27 (supplying 36 to 54 pounds P_2O_5) annually after the first season.

Results from these experiments indicate these rates to be adequate for a high level of production. However, unless the soil was high in phosphorus to begin with, dropping below the minimum rates will be inviting a reduction in yield and stand.



With an application of 100 pounds of phosphorus at seeding, the benefit was as great the second year as the first. With "no phosphorus" or with 50 pounds per acre, the amount of phosphorus in the plants fell down the second year.

TALL FESCUE AND ORCHARD GRASS ANALYZE SAME

Tall fescue and orchard grass look differently and probably taste quite differently, but in chemical composition they are almost identical, according to D. S. Chamblee and W. W. Woodhouse, Jr. Extensive analyses of these plants grown in the field and greenhouse on several soil types show very little difference in their nitrogen, phosphorous and calcium value.

The following analyses are typical of those found in many tests.

	N	P_2O_5	C_aO
Orchard grass . .	2.44	.75	.57
Tall fescue	2.21	.72	.45

Either in pure stand or in mixture with Ladino, these grasses analyzed quite similarly. In greenhouse studies using soils from the Tidewater, Piedmont and Mountain sections, analyses were made of six

(Continued on next page)

Dixie Crimson Clover Merits Consideration

With all the recent enthusiasm for Ladino clover, any other promising forage in North Carolina is likely to be overlooked. R. L. Lovvorn and E. U. Dillard feel that such may be the case with Dixie crimson clover.

A combination of Dixie crimson clover and Coastal Bermuda grass produced 216 pounds of beef per acre between March 25 and September 16, 1948, on the Animal Husbandry Farm at Central Station. This pasture is located on a thin, badly-eroded site that was virtually abandoned land before being established with this reseeding clover and perennial grass.

Most of the animal gains were actually produced before April 20 because at that time the cattle were removed to allow the clover to mature a partial crop of seed. It is estimated that 100 pounds of seed was produced per acre although it was not harvested.

The Bermuda grass was planted in four-foot rows in the summer of 1947. It had not produced a complete sod by the end of the 1948 growing season, although it furnished intermittent grazing from June 29 to September 16. The cows were again turned on the pasture about December 1 to graze the volunteer stand of Dixie crimson clover. Lovvorn and Dillard ask, "What is more fool proof than a volunteering crimson clover in a stand of Bermuda grass?"

FESCUE VS. ORCHARD

(Continued from page 12)

harvests. The average nitrogen contents of orchard grass and tall fescue were identical, both being 2.88 per cent.

Both grasses frequently are seeded with Ladino clover, and both contribute a fair share in the overall feeding value of the mixture.

Meadow Hay Should Be Cut Early

Meadow hay, cut during the early bloom stage, continued to produce greater gains in beef cattle at the Upper Mountain Experiment Station than similar hay cut after it was fully matured. The feeding trials were conducted during the winter months by Lemuel Goode, J. A. Graham, R. L. Lovvorn and W. W. Woodhouse.

Yearling steers and heifers were divided into equal groups and used to measure the amount of regrowth following each cutting as well as determine the feeding value of the two hays.

The late-cut areas yielded 24 per cent more hay than the early-cut areas. However, steers grazed on an early-cut area gained an average of 83 pounds per head during a 69-day grazing period. Steers grazing the late-cut area gained only 74 pounds and had to be removed at the end of 55 days. Heifers, grazed on another early-cut area, gained 72 pounds, while those grazing the late-cut area gained 68 pounds. Both groups were removed after 55 days grazing.

As the regrowth was grazed out the cattle were moved to the barn and started on hay. At the end of the winter feeding period steers fed early-cut hay had gained an average of 46 pounds per head. Steers fed late-cut had had lost 30 pounds. Heifers fed early-cut hay gained 11 pounds per head, while those fed late-cut hay lost 68 pounds.

A wintering period of 154 days was required for all groups except the steers grazing the early-cut area and receiving the early-cut hay. Because of the extra grazing provided by the regrowth, this group was winter fed only 140 days.

FESCUE-LADINO TOPS AS WINTER COMBINATION

If a day's grazing is worth more in the winter than in the summer, then tall fescue and Ladino clover have certainly increased the value of pastures on the Animal Husbandry Farm at the Central Station.

By holding the cattle off during the fall and allowing the growth to accumulate, E. U. Dillard and R. L. Lovvorn have greatly improved the winter grazing program. The system works better with tall fescue-Ladino than with orchard grass-Ladino pastures. Fescue appears to be more tolerant of cold weather than orchard grass.

Beef cattle grazed in this manner were removed from the fescue-Ladino pasture on December 22 in 1947 but not until January 11 the following winter.

Herefords on the Animal Husbandry Farm take full advantage of Ladino clover-fescue pasture—the top combination for winter grazing. The herd grazed until December 22 in 1947 and until January 11 the next winter.

FERTILIZATION IS A "MUST" ON LADINO

Fertilization is a "must" for Ladino clover on most North Carolina soils. The results in the accompanying figure show the truth of this statement for a Bladen silt loam at the Tidewater Branch Experiment Station near Plymouth.

Need Complete Fertilizer

By using phosphate, potash, and limestone, W. W. Woodhouse, Jr. and D. S. Chamblee produced a very satisfactory first-year yield of nearly 3½ tons. By leaving off one material at the time, the investigators determined the relative importance of each.

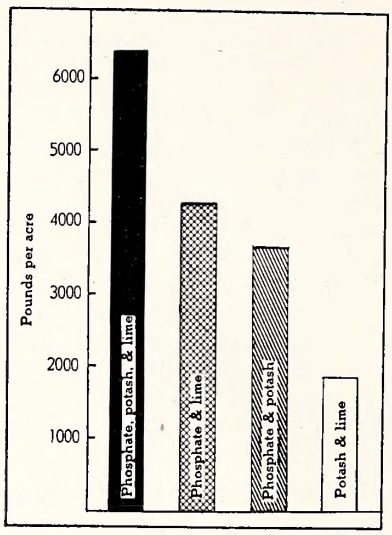
Leaving off potash caused the least damage but reduced the yield more than a ton. Omitting the lime application cut the yield by nearly half. Pasture production really hit the skids when phosphate was left out, the yield falling to less than a ton of forage per acre.

On this particular soil, phosphate was most critical. However, on many fields, potash or limestone will be more essential. All three will be needed unless they have been supplied by heavy fertilization and liming in recent years.

A Further Boost From Phosphote

What happens when more than the recommended amount of phosphate is applied to Ladino clover pasture? In another test at the Tidewater Station, W. W. Woodhouse, Jr. and R. L. Lovvorn secured further increases in yield with rates of phosphate fertilization up to 400 pounds P_2O_5 per acre. The recommended rate provides about 100 pounds P_2O_5 per acre.

Woodhouse and Lovvorn say that seeding time is the ideal time to establish a high level of phosphorus in the soil. This gets the seedlings off to a good start. Small annual topdressings will then maintain high production.



Phosphote, potash and lime are all essentiol for a good yield of Ladino clover. The yield decreases if either of the materiols is left out.

Ladino Yield High at Willard

Ladino clover continued to be successful on the Coastal Plain Station, Willard, during 1948 in grazing studies conducted by E. W. Faires, R. K. Waugh, and R. L. Lovvorn.

The Ladino paddock that produced 203 cow days in 1947 produced 214 in 1948, or feed equivalent to approximately four tons of alfalfa hay per acre. Cows grazed the plot until December 15 which accounted for most of the increase over the previous year.

The check paddock, an adequately-fertilized carpet grass sod, provided 168 cow days per acre. This was also greater than in the previous year but still below the three-year-old Ladino clover stand across the fence.

In another pasture at the same station, a combination of Ladino clover and tall fescue provided 212 cow grazing days or as much feed as would be contained in 6,748 pounds of alfalfa hay.

Hence, Ladino clover is decreasing greatly the need for hay and silage on what is becoming "A Grassland Farm."

Lespedezas Resist Nematodes

Certain strains of lespedeza tested on nematode-infested soil have shown some resistance to damage caused by this pest, according to C. H. Hanson and Guy Owens. Annual lespedezas often are subject to severe attacks of root-knot.

Characteristic symptoms of infested plants are stunting, yellowing and death of the plant in severe cases. Swelling or galls are formed along the roots, producing a knotty, abnormal root system. Selection work and testing on nematode-infested soils in various parts of the state is being continued.

Root knot, which is caused by nematodes or tiny eel worms, is not only a serious pest on lespedeza, but also on many other crops. The scientists use two means of control. One is to breed for resistance as in the case of this lespedeza, and the other is using chemicals for soil treatments.

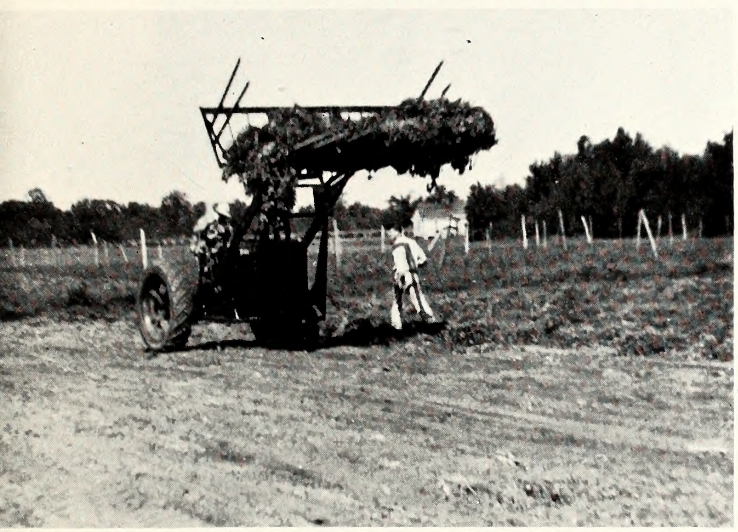
Sweet Clover Gives High Yield of Beef

Most sweet clover grown in North Carolina is concentrated in a few counties in the upper piedmont where it is used primarily as a soil improvement crop. Results from 1948 grazing experiments conducted by E. H. Hostetler and W. W. Woodhouse, Jr., on the Animal Husbandry Farm, Raleigh, would suggest that the crop has real possibilities for beef cattle grazing.

More than 200 pounds of beef per acre were produced from a second-year sweet clover crop between March 30 and June 15. The cattle were removed at that time to permit a partial crop of sweet clover seed to mature. Barley was seeded on the land in September to be grazed during the winter and spring.

The grazing system is designed to produce grazing from sweet clover during the fall of the first year, the spring of the second year, and from barley during the following winter and spring. Volunteering sweet clover in the barley will start the rotation again in the spring of the third year. The experiment is only two years old, but Hostetler and Woodhouse see much promise for this combination in the cattle gains from the sweet clover and the growth of winter barley following this deep-rooted legume.

NEW PEANUT HARVESTING METHOD EFFICIENT



A new peanut havesting method tried out in 1948 by N. C. Teter and G. W. Giles, resulted in increased yields and improved quality as well as a saving in labor and power, the two engineers report.

The method consisted of three field machine operations: (1) dig, shake windrow with a comercial machine; (2) pick up from windrow with a tractor-mounted buck rake and deliver to the picker; and (3) pick with a commercial picker.

Cuts Labar Needs by One-Third

This method required 14.3 man hours per acre as compared with 23 man hours per acre required by the usual method of harvesting. At the same time, an additional 236 pounds of peanuts and twice as much hay of excellent quality were saved per acre. The machine method required about 33 more H. P. hours per acre.

Giles and Teter found the buck rake satisfactory for picking up the windrowed plants, although breaking of the teeth or tines caused some trouble. The green vines cause no damage to the picker but do tend to clog the cleaning screen so that picking time is increased to 3.4 hours per acre.

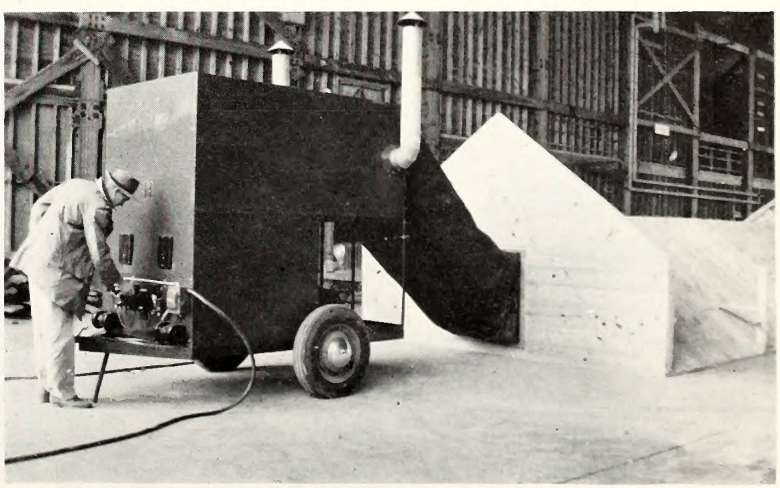
The peanut plants were left in the windrow for 11 days after digging because of rainy weather. During this time, the nuts dropped from 47.0 to 41.6 per cent moisture content. After the picking operation (3) was

The peanuts are dug and windrawed (tap) with a commercial twa-raw machine, thus saving considerable labar.

The dug peanut plants are remaved fram the windraw and carried ta the picker with a tractar-maunted buck rake.

Green peanuts are then harvested by a canventianal peanut picker (lawer left). The vines are saved far making hay.

A partable dryer is used (belaw) ta dry the peanut hay. The hay has praved af excellent quality when sa handled.



Present peanut harvesting and curing methods are inefficient and costly as shown by the above aerial photo taken by Charles Killebrew of Rocky Mount. Present methods not only waste labor but also cause heavy losses in the yield and quality of the nuts and hay. Not included in the picture are the costly operations of digging the nuts and stacking by hand.

An experimental commercial peanut combine (below) equipped with a windrow pick-up attachment was considered too slow to be generally recommended to farmers.

completed the peanuts were placed in bins in a crop drying building where drying was completed with an air flow of 30 cubic feet per minute per cubic foot of peanuts. The air was heated about 15 degrees F. above outside temperature before it was forced through the peanuts. After 32 hours of drying, the peanuts were down to 10.8 per cent moisture content.

The peanut hay was dried on the slatted floor of the crop drying building at the same time the nuts were dried in the bins. The yield of 2800 pounds of hay per acre was reduced from 54.0 to 15.0 per cent moisture content during the 32-hour drying period. The yield from the usual stack field curing method for comparison was only 1395 pounds of low quality hay.

Peanuts which are dried rapidly to a point below 9.0 per cent moisture content will show considerable skin slippage and splitting when shelled.

Try Combine With Pick-up Attachment

An experimental commercial peanut combine equipped with a windrow pick-up attachment was tried for picking peanuts immediately after they were dug and windrowed. This method required the least total labor and power but was considered too slow (3.2 hours per acre) to be recommended.

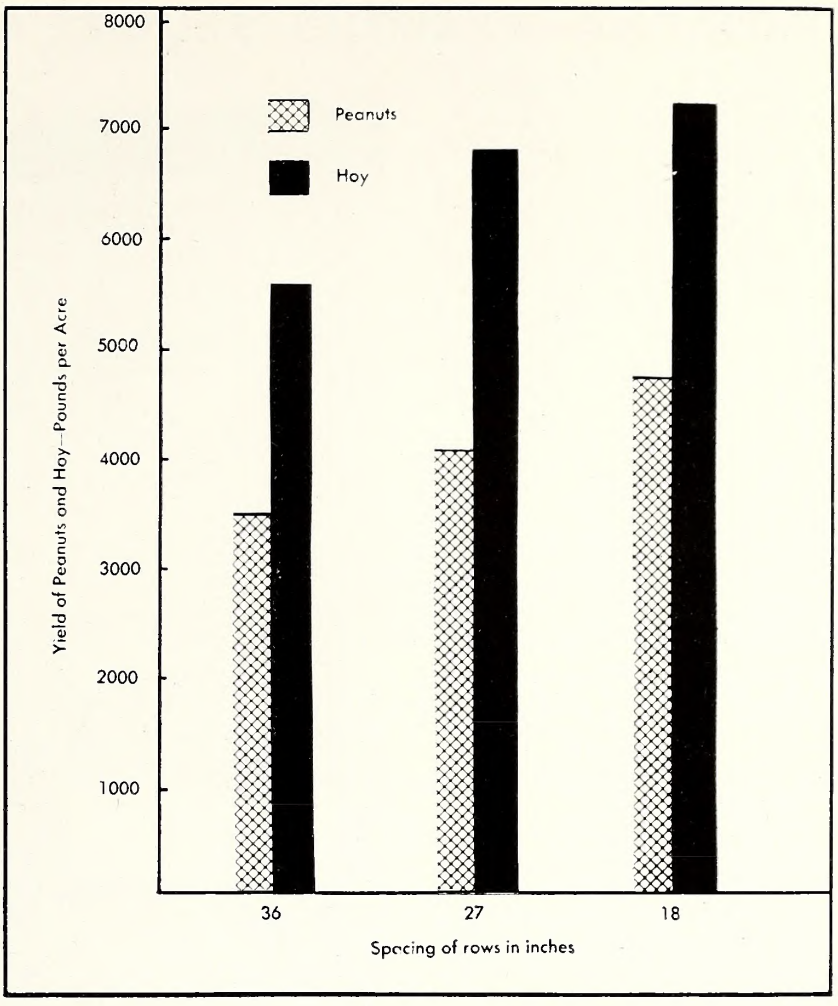
Further work was continued in the development of a once-over green peanut harvester in 1948. The new principle of cutting the taproot, grasping the top of the plant with mechanical fingers and easing it out of the soil with nuts hanging downward proved basically sound. This method loses only 110 pounds of nuts per acre as compared with 320 pounds per acre lost by a commercial digger-shaker.

Reduce Row Width To Increase Yields

On a light sandy soil low in organic mater, decreasing the row width from 26 inches down to 18 inches gave marked increases in peanut yield, in tests conducted by W. L. Nelson.

The respective yields for 36-inch, 27-inch, and 18-inch rows were 3340, 4000, and 4640 pounds per acre of nuts shelling 60 per cent large and medium. Varying the plants from 4 to 12 inches apart in the row had little effect on yields in this experiment. Hay yields were also higher in the close rows. Since the soil in this experiment was low in available potash, the application of that element increased both nut and hay yields. An average of all the row spacings showed that potash increased the yield of nuts 730 pounds per acre. The hay yields were increased 690 pounds per acre.

On two darker soils which produced large top growth of peanuts, yields of nuts were not appreciably affected by decreasing the row width. Considerable insect damage to the nuts occurred in these experiments, however. Additional row-spacing studies are needed on the darker colored soils.



Closer spacing of raws boasted the yield af hay as well as that af the peanuts (abave). Narraw rows shade the graund saaner, require less cultivatian (below).

Hybrid Peanut Looks Good

Higher yields of better peanuts are in prospect from the hybrid populations under study by W. C. Gregory.

Gregory has found increases of 10 to 20 per cent in shelling percentage, decreases of as much as 90 per cent in diseased and damaged seed at the time peanuts are dug. Some hybrids have increased total production on a one-year basis as much as 40 per cent. There is a wide range in maturing dates among lines under study.

For commercial production these favorable gains must be combined in a single variety for the producer. Work is now in progress toward this end.

The hybrid populations are now four generations from the first crosses. The purification and fixation of these hybrid mixtures will require at least three additional generations.

IMPROVED VARIETIES REQUIRE BETTER PRACTICES

Date of seeding, fertilization at seeding, nitrogen topdressing, varieties, and seed bed preparation all affect small grain yields, according to W. H. Rankin. For the past several seasons, Rankin has been evaluating factors influencing grain yields.

In 1948 a combination of poor practices was compared with a combination of favorable practices at locations in Forsyth and Montgomery Counties. The good practices produced yields of 60 bushels of oats, 26 bushels of wheat and 28 bushels of barley per acre. The poor practices gave yields of 35 bushels of oats, 12 bushels of wheat and 18 bushels of barley.

Rankin reports a response of seven bushels per acre to the application of phosphorus on one test plot where the level of phosphorus in the soil was low. Differences were evident in the early growth, stooling and date of maturity of plots under comparison.

In the above photo, the plot of oats on the left was seeded October 1 and yielded 61 bushels per acre. The plot on the right was seeded after November 23, yielded only 22 bushels.

The importance of phosphorus is shown in the lower photo. With adequate phosphorus, the plot on the left made an earlier growth and stooled out better than the plot on the right.

Colonial Barley Tops Sunrise

In seven Experiment Station and 15 Official Variety Tests, conducted over the past four years, Colonial barley (Sunrise x Davidson 2989) has produced an average of 47.9 bushels of grain as compared with 42.7 for Sunrise, report G. K. Middleton and T. T. Hebert.

This new veriety is similar to Sunrise in head type, but has a shorter, stiffer straw than does the latter.

Like Sunrise, Colonial is resistant to certain races of mildew, and has some tolerance to leaf rust as does Davidson. This resistance to rust, together with a short straw, has caused it to stand well through rust epidemics at several locations where Sunrise has lodged badly.

Small Grain Practices Work as Team

A question commonly heard is, "What is the best variety for my section?" Recent investigations conducted at the McCullers Branch Experiment Station by G. K. Middleton and T. T. Hebert show that it is more important to be "choosy" about your varieties when you plan to follow the best cultural practices than when you are farming to produce only average yields. This is especially true when date-of-seeding is involved.

During the last three years, Middleton and Hebert have studied the yields of nine varieties of oats when seeded in early October as compared with late November. Yields of the top and bottom variety in the early seeded test were 87.3 and 52.4 bushels per acre, respectively. For these same two varieties, the yields obtained from late seedlings were 61.1 and 50.6 bushels.

In the first case there was a difference of 40 per cent, while in the second a difference of only 17 per cent. In other words, the potential yielding ability of the better variety could not fully express itself when seeded late. To produce at its best, it had to be seeded early enough to develop a good root system and to stool out before cold weather.

Other cultural practices, and especially fertility levels, also affect relative varietal response. What is wanted is a variety that will respond to optimum conditions. Then, we must provide these conditions if we are to make full use of its productive capacity.

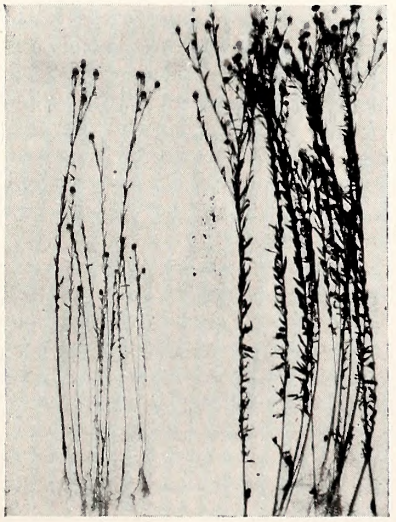
New Barley Disease Found at Statesville

A mosaic disease of barley was observed for the first time in North Carolina on the Piedmont Branch Experiment Station at Statesville in the spring of 1948, according to T. T. Hebert and G. K. Middleton. The diseased plants were stunted, and their leaves mottled, showing numerous light green or yellowish areas. Severely affected leaves had very little normal green coloring left.

The disease is believed to be caused by a virus—probably the same virus that causes wheat mosaic. Infection occurs when barley is planted on infested soil. Mosaic apparently is not transmitted by the seed.

One barley yield test containing 23 strains was entirely within the infected area on the Statesville farm. Ten of these strains proved to be susceptible to mosaic while 13 of them were resistant. The average yield of the 10 susceptible strains was 18.4 bushels per acre as compared to 42.8 bushels per acre for the 13 resistant strains.

In 1947, when no mosaic was observed in the nursery, the average yields of these two groups were 45.5 and 45.1 bushels per acre, respectively. These figures indicate that mosaic may be an important factor is reducing the yields of susceptible varieties.



Same varieties of barley (right and left) were resistant to the mosaic disease found on the Statesville farm in the spring of 1948. Others (center) had no resistance.

New Rust, Mildew-Resistant Wheat Developed

The development of two strains of a new stiff-strawed, rust and mildew-resistant wheat is announced by G. K. Middleton and T. T. Hebert.

These are Atlas 50 and Atlas 66 from the cross Frondoso x (Redhart x Noll) (formerly 5450 and 5466.) As an average of four years tests at the McCullers Station, three years at the Piedmont Station, and eight trials in the Official Variety Tests, they produced the yields shown below in comparison with other locally grown varieties.

Variety or Strain	Yield in Bus. Per Acre
Frondoso x (Redhart-Noll) Atlas 50	31.2
Frondoso x (Redhart-Noll) Atlas 66	29.5
Hardired	30.3
Redhart	25.7
Carala	25.2
Nittany	24.2

These new wheats are a few days later in maturity than Redhart and Carala—about the same as Hardired. Both strains have good resistance to the locally prevalent races of mildew and leaf rust, with Atlas 66 having excellent resistance to rust. These diseases have been especially severe at the McCullers Station, where, as an average for four years, these two strains have produced 33.0 bushels as against 22.1 for Redhart and Carala. In other words, where the diseases have been severe the new wheats have produced yields 50 per cent above the two early susceptible varieties.

Flax Has Place in Piedmont

Yields of 18 to 20 bushels of seed flax per acre were produced at the Piedmont Experiment Station, Statesville, with fertilization similar to that for small grain.

W. H. Rankin, who conducted the tests, says flax can be grown in the Piedmont area. Whether it should be grown he says will depend on its profitableness in relation to crops now being produced in that area.

Six varieties were grown under four nitrogen treatments at Statesville and at Rocky Mount. The yields at the Coastal Plain Station, Rocky Mount were very low.

The flax plants on the right were from a plat that received 60 pounds of nitrogen and yielded 19 bushels per acre. The plants on the left received no nitrogen and yielded only 11 bushels.

SPREAD OF BLACK SHANK DISEASE CONTINUES

Black shank has now spread to nearly all of North Carolina's 62 flue-cured tobacco-producing counties, according to E. L. Moore, G. B. Lucas and E. E. Clayton.

Eleven eastern counties had from two to four times as many fields infested in 1948 as in 1947. Pitt County which leads the State in tobacco production, had black shank on 60 to 65 per cent of the 32,000 acres where tobacco was grown last year.

At least five counties are so badly infested that it is advisable to grow only varieties resistant to the disease. These counties are Forsyth and Stokes in the west, Rockingham in the central and Pitt and Greene in the eastern part of the State. An even more pressing problem is the fact that black shank is appearing on more and more soil already infested with Granville wilt.

The most promising method for controlling black shank is the use of resistant varieties. Resistant varieties now in use—Oxford 1 and 3 and certain of the Vesta strains —are serving a useful purpose, but they do not measure up to the better standard varieties in yield and quality. Neither do they have resistance to Granville wilt.

Several new experimental lines with combination resistance to both black shank and Granville wilt are showing up well in preliminary tests. Two of these lines, known as 8213 and 8259, yielded 981 pounds and 805 pounds of cigarette tobacco, respectively, at one location, while the average for Oxford 26 was 750 pounds. Their per acre values at the same location were $632 and $471, respectively, while the value for Oxford 26 was $399.

The raws on the right ond left are some of the new black shank disease resistant lines. Note how the disease destrayed a check raw of variety 400 in the center.

Leaf Hybrids Germinate Earlier, Grow Faster

Experimental tobacco hybrids developed by M. S. Patel, P. H. Harvey and W. C. Gregory have germinated earlier and grown faster than either of the parent lines.

Seven varieties were selected in 1947 for hybrid breeding work in North Carolina. Of the seven, four were popular flue-cured varieties, namely: 402, Bottom Special, Oxford 26 and Oxford 2. The other three were Burley Kentucky 16, TL 106 and Keliu 49 (from India).

Out of all the crosses, 35 furnished enough seedlings to carry out a replicated trial at the McCullers Station. A detailed study was made on the following characters: (1) seed weight; (2) seedling weight; (3) germination dates; (4) plant height; (5) leaf number; (6) leaf length; (7) leaf breadth; (8) sucker count; (9) flower dates; and (10) yield (cured leaf).

The hybrid resulting from a cross of Burley Kentucky 16 and Bottom Special had leaves that averaged almost four centimeters longer than those of the better parent. The average plant height of the hybrid was 84 centimeters compared to 71 for the Bottom Special, the taller parent. The yield of the hybrid was 1,694 pounds compared with 1,585 pounds for Bottom Special and 1,338 for Burley Kentucky.

Patel, Harvey and Gregory conclude that though it will be some time before the results will be ready for on-the-farm application, hybridization will almost certainly figure in the future of the flue-cured tobacco industry.

Methyl Bromide Shows Promise as Weed Killer

Among several weed killers tried out in tobacco plant beds during 1948 by G. D. Hill and G. C. Klingman, methyl bromide showed particular promise.

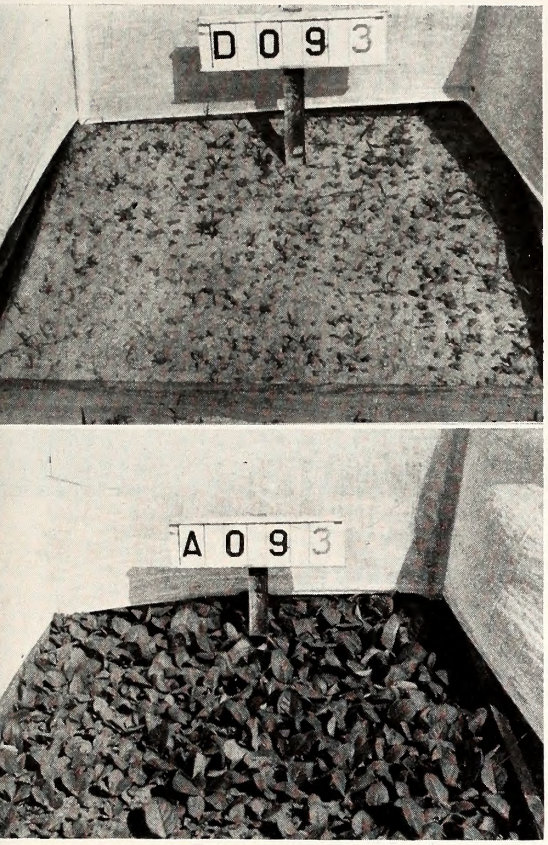
Tobacco plants from seeds sown 84 hours after methyl bromide had been applied as a gas showed no signs of injury. This chemical was not specific, but it killed all of the weeds, including Bermuda grass. Hill and Klingman say the chemical may eventually prove valuable as a spring treatment, but it cannot be recommended until tested further.

Some of the chemicals used killed all weed seeds of some species and apparently none of the others. For instance, ammonium nitrite killed evening primrose but did not control white clover or Kobe lespedeza. Sodium azide was effective against lambsquarter, but not so effective on white clover.

Some chemicals had a reverse effect—they increased, even doubled germination of certain weeds. Plots treated with isopropyl phenyl carbamate contained twice as many crabgrass seedlings as check plots.

Weed control with chemicals other than uramon and cyanamid is still in its preliminary stages, the two investigators conclude.

Fall-Treated Beds Yield More Plants



The upper plant bed received no fall treatment and no nitrogen. The bed below received no nitrogen in the fertilizer, but the fall weed treatment apparently took care of its needs.

More plants were produced on tobacco beds receiving fall treatments than on beds not fall-treated, in tests conducted by W. G. Woltz at the McCullers, Rocky Mount and Oxford Branch Stations in 1948.

On beds fall treated with uramon and cyanamid, the addition of nitrogen in the fertilizer at the time of seeding was of no benefit, Woltz found. In some cases, added nitrogen actually reduced the stand and the number of transplantable plants, particularly where cottonseed meal was added to the fertilizer.

Calcium cyanamid used alone in the fall and without nitrogen fertilization at time of seeding did not give as good results as did uramon plus cyanamid in the fall. This practice did, however, give considerably better results than did any nitrogen fertilization at time of seeding on non-fall treated beds.

The application of the phosphorus and potash at the time of fall treating instead of at seeding time also gave encouraging results. Woltz says there are indications that plant bed failures reported by growers who have fall treated their beds, have been due in part to heavy fertilization at seeding time.

A Three-Point Plan for Flea Beetle Control

Construct insect-tight plant beds; use insecticides on exposed plants; and get rid of left-over plants—these are the three steps to follow in protecting tobacco plant beds from flea beetles. C. F. Stahl and J. V. Gilmore base these recommendations on several years of investigation at the Oxford Station.

There are two periods in the development of tobacco plants when they are especially vulnerable to flea beetle damage, the entomologists say. The first is when the plants are coming up through the soil and before they have reached the size of a dime in diameter. The second critical period is between the time the plants are set in the field and when they begin to grow vigorously.

Two insecticides have given excellent results in general plant bed use at Oxford—5 per cent DDT and 70 to 80 per cent cryolite applied as dusts. The plants should be thoroughly dusted just before they are pulled.

Stahl and Gilmore suggest several ways for cleaning up old plant bed sites which make ideal breeding grounds for flea beetles. One way is to pull the unused plants and scrape the soil with a hoe to a depth of one inch. This was found to reduce by 81 per cent the number of beetles emerging from the plant bed. Plowing and harrowing reduced the number by 63 per cent. A third way is to apply fuel oil at the rate of one pint per square yard, using a small sprinkling can. This has been found to reduce beetle emergence from 98 to 100 per cent.

Tests Show Calcium Needs of Tobacco

On soils with approximately pH 5, 150 pounds of calcium (CaO) in the fertilizer per acre was sufficient to meet the needs of the plant for this element, report W. E. Colwell, W. G. Woltz and W. A. Reid. The experiments with calcium are part of a continuing study to determine the effects of fertilization upon tobacco quality.

Following are yield and value data for four levels of calcium fertilization:

Lbs. of CaO Per Acre In Fertilizer	Yield (lbs.)	Value Index
50	1317	329
150	1409	367
300	1381	356
150*	1394	356

* Plus soil limed from pH 5 up to about pH 6.

Chlorine is not considered an essential element in plant growth, but it is found in considerable quantities in most mixed fertilizers. Small amounts of this element (20 to 30 pounds per acre) act as a stimulant to the tobacco plant, but large amounts may cause injury to the plant, resulting in stunting and a loss in yield and value per acre.

Field results reveal that the content of chlorine in the leaf increases with the addition of this element in the fertilizer. Applying the chlorine fertilizer as topdressing 20 days after planting resulted in a larger percentage of this element in the cured leaf.

Laboratory results showed that an increase in the chlorine content of the leaf slowed down the rate of burn of the cigarette. Tobaccos high in chlorine burn with a dark colored ash which signifies incomplete combustion of the tobacco—a property that is considered very undesirable.

When the addition of chlorine in the fertilizer was increased to 75 pounds per acre, the per cent of chlorine in the plant reached 2.5. At this point the rate of burn decreased from two inches per 1,000 where the chlorine content was zero to one and a half inches per 1,000 seconds.

At right is the new tobacco curing barn which is being develaped at the Oxfard Branch Station.

Engineer Develops New Curing Barn

A new type tobacco curing barn has been developed by L. B. Altman, Jr., at the Oxford Station, providing separate compartments for (1) initial yellowing and ordering; (2) final yellowing; (3) drying the leaf; and (4) drying the stem.

The tobacco is placed on racks and moved through compartments with progressively higher temperatures. Tobacco is left in each compartment about one day or until the tobacco in the final yellowing compartment will hold one rack of about 100 sticks, curing capacity in the farm-size barn is about 600 sticks per week.

Gives Better Cures

A barn of this typs gives higher quality cures, Altman reports, largely because it is easier to maintain uniform curing conditions in the small compartments than in conventional barns. With a new cure being started each day, it is possible to make daily primings, thus picking the tobacco at the correct stage of maturity.

The barn takes less fuel because fires may burn at an almost constant rate throughout the curing season, and because more efficient use is made of the heat.

Can Be Made In Multiple Sizes

Tobacco barns of the new type may be built in multiple sizes. The one at Oxford is a double barn, having a curing capacity of 1,200 sticks of tobacco a week. The heated part of the barn is divided into three lanes. The center lane is heated to about 100 degrees by heat transferred through the walls and ventilators from the outer lanes. It is used for initial yellowing and for ordering the cured tobacco.

Curtains divide each of the outer lanes into three compartments. A heat distribution system is in a basement under each of these lanes. Channel iron is used for tracks on which to roll the racks over the heating system. Each compartment and the center lane have ventilators for controlling the humidity.

New Lines Outyield Oxford

New Granville wilt resistant lines of tobacco produced added profits up to $256 per acre more than Oxford 26 in 1948 test plantings made by E. L. Moore, G. B. Lucas and E. E. Clayton. Oxford 26 is the present variety used most widely on wilt-infested soil.

More than 100 resistant lines were tested for yield in 1948. One of the more promising varieties was 8238 which at one location yielded 1,418 pounds of cigarette tobacco valued at $1064. At the same location, Oxford 26 yielded 957 pounds valued at $863.

Renovate Curing Barns To Reduce Fuel Costs

Experiments by O. A. Brown and N. W. Weldon indicate that old flue-curing tobacco barns can be renovated to give curing results almost as good as those obtained in new barns with the recommended type ventilating system.

Brown and Weldon cite actual on-the-farm records, comparing the cost of curing in renovated barns with that of curing in new barns. One old remodeled barn required 1.8 pounds of coal per stick of tobacco. The new, insulated barn required 1.63 pounds, showing not too great a difference.

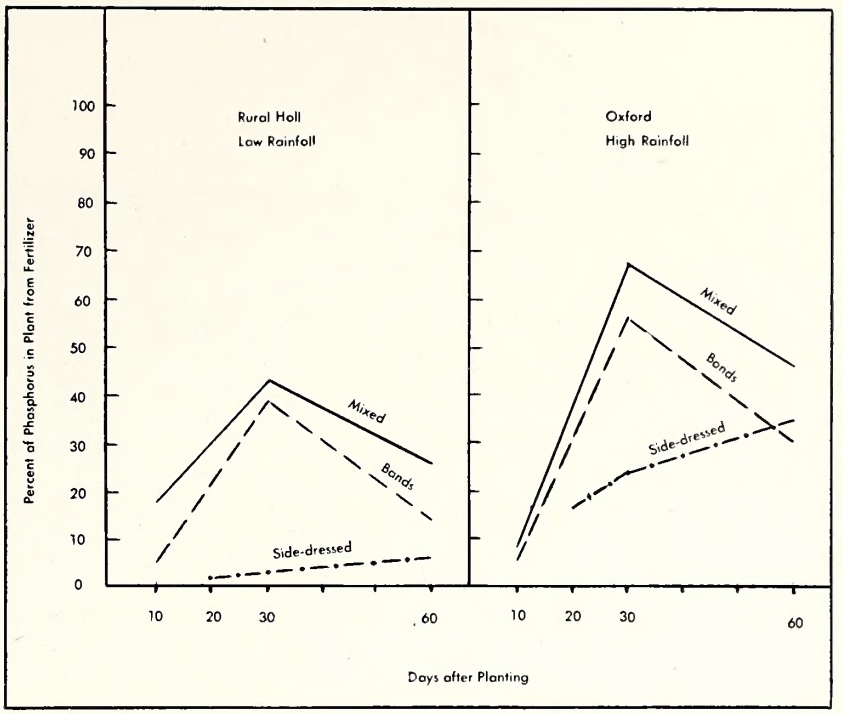
The two engineers advise making the walls of an old barn tight, preferably by installing materials on the inside walls. The roof should also be insulated. It is a good practice, they say, to put solid sheathing of well-dried lumber on the rafters before roofing a barn. If a metal roof is used, a layer of building paper should be placed between the sheathing and the metal roof.

Top or ridge ventilators have proved superior in these experiments. Such ventilators should permit close adjustments, ranging from completely closed to about four square feet of opening along the ridge. They should be so constructed as to permit down drafts.

More "Tracer" Studies

By the use of radioactive phosphorus, W. G. Woltz and N. S. Hall were able to distinguish in the plant between the phosphorus that came from the fertilizer and that which came from the native supply in the soil. This new technique affords a greater opportunity for studying fertilizer placement than was heretofore possible.

In their investigations in 1948, Woltz and Hall found that side-dressing tobacco with phosphorus ten days after planting resulted in a very low utilization of the fertilizer phosphorus. This was particularly true in the early stages of growth of the plant at which time phosphorus is of greatest importance in promoting growth. Under the dry weather conditions at Rural Hall, North Carolina, side-dressing of phosphorus resulted in a very low utilization of the applied phosphorus throughout the entire season.



Very little of the phosphorus applied as a sidedress 10 days after planting was used by the tobacco plants. When the phosphorus was applied in bands or mixed with the soil at planting, a much higher proportion was used. Note that heavier rainfall in the Oxford test led to higher utilization of the phosphorus.

Instrument Used to Measure Leaf Yellowing During Cure

A method to give exact numerical values of yellowness in the tobacco leaf is being developed by P. E. Green and O. A. Brown at the Oxford Branch Station. If successful, it will help tobacco growers to accurately determine the stages of curing during the yellowing period.

By using an instrument for comparing the intensities of corresponding colors, the two engineers find that certain color components, practically invisible to the eye, show the yellow content of the leaf more effectively than does the visible yellow color itself.

A method of determining the ripeness of the leaf before and during harvest is also being developed by Green and Brown. The aim is to enable the grower to fill his barn with uniformly ripened tobacco which should result in a more uniform cure and quality. A beam of green light is directed on the leaf, and measurements taken of the amount reflected from the leaf. There is an increase in the amount of green light reflected as growing leaves ripen.

Phosphorus Increases Yield of Turkish

The use of adequate phosphorus can increase the yield of Turkish tobacco by as much as 350 pounds per acre, with an even more pronounced effect on quality, reports Luther Shaw of tests conducted at the Mountain Branch Station near Waynesville.

A three-year average of the Waynesville tests shows that plots receiving no phosphorus yielded 1,052 pounds of tobacco. Those receiving phosphorus at the rate of 40 pounds per acre yielded an average of 1,155 pounds per acre, while those fertilized with 160 pounds of phosphorus yielded 1,421 pounds per acre.

A grade analysis of the 1947 crop showed that where no phosphate was used, about 75 per cent of the tobacco graded either 4th quality or as "trash." Neither of these grades are of much use in the blending of cigarettes.

The addition of phosphate at the rate of 40 pounds per acre brought a definite improvement in quality. With 160 pounds of phosphorus per acre, a little over half of the tobacco was in the first three quality groups.

Phosphorus makes a big difference in the yield and quality of aromatic tobacco. The bale on the left represents the yield of 1,052 pounds taken from a "no phosphorus" plot: the bale on the right, 1,421 pounds from a heavily fertilized plot.

Soybeans, planted as a second crop after Irish potatoes, yielded an average of 31.6 bushels per acre for 3 years. The crop is shown above at 6 weeks after planting.

SOYBEANS YIELD WELL AFTER POTATOES

Soybeans planted about June 20-25 after a crop of Irish potatoes was harvested made an average yield of 31.6 bushels per acre. The work was conducted the last three years by W. L. Nelson and C. D. Welch at the Tidewater Experiment Station.

They found that soybeans planted after Irish potatoes do not need additional fertilizer. Irish potatoes received high amounts of fertilizer, usually about one ton of 6-8-6. A considerable amount of this is left in the soil after the potato crop is harvested. Soybeans have a somewhat more extensive root system than Irish potatoes, and can utilize residual fertilizer effectively. Planting soybeans after potatoes is one means of securing greater returns from the fertilizer applied on the potatoes.

PLACE PHOSPHORUS IN BANDS FOR HIGHER YIELDS

On a soil low in available phosphorus, phosphorus placed in bands near the seed gave higher soybean yields than when the phosphorus was broadcast and disced in, report W. L. Nelson and C. D. Welch.

A yield increase of 6.3 bushels was obtained when the phosphorus was placed in bands 2½ inches to each side and two inches below the seed. However, when it was broadcast and disced in, a yield increase of only 1.7 bushels was obtained.

Soybeans need phosphorus early in the growing period when the root system is limited. Hence, on soils low in phosphorus, a concentrated supply of fertilizer phosphorus close to the young plant is extremely beneficial.

When placed in bands on each side of the raw phosphorus increased the yield of soybeans 4.6 bushels per acre more than the same amount of material broadcast and disced in.

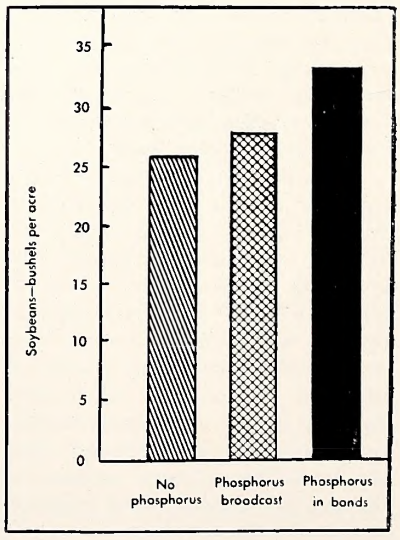
Good Stands, Close Rows Aid Control of Weeds in Soybeans

From variety tests conducted at several locations during 1948, E. E. Hartwig and H. W. Johnson found that Roanoke and Ogden are still the best adapted varieties for seed production in North Carolina. This is the sixth year that these two varieties have held such a position.

From observations and experiments it has been found that stand and width of rows are important factors in gaining high yields, preventing lodging, and obtaining weed control. A good stand and close rows aid in weed control, but there is an optimum beyond which lodging is increased and yields are reduced. Best spacing in the row is not the same for all varieties nor for all locations.

Rows 36 inches apart are ideal for both Ogden and Roanoke at almost any locality in the state. For Roanoke the best number of plants per foot is from 6 to 10; for Ogden 8 to 12. Since Roanoke lodges more readily than Ogden, especially where conditions are favorable for rapid growth, wider spacings of the plants of this variety are recommended to reduce the lodging.

In areas where soil and moisture conditions support a vigorous growth the wider spacings in the row are recommended. The closer spacings are recommended in areas where soil and moisture conditions support a less vigorous growth.



AN ALL-ROUND COTTON PROGRAM

Proper liming, good rotations, good stands and sufficient fertilizer all help in giving higher yields of cotton, according to W. L. Nelson and C. D. Welch.

Liming:

At two locations where the soil was rather acid cotton yields were increased by broadcasting one ton per acre of dolomitic limestone (Figure 1). In Edgecombe County, lime increased the yield of seed cotton 417 pounds per acre, while in Bertie County the yield was increased 209 pounds per acre. The lime requirements of the two soils were first determined by soil tests.

Rotations:

In 1948, seed cotton yields were 413 pounds per acre higher in a cotton-corn rotation than in a cotton-peanut rotation (Figure 2). The two rotations were started at the Upper Coastal Plain Experiment Station several years ago. The cotton receives adequate fertilizer in both rotations.

Physical measurements have shown the soil to be less compact in the cotton-corn rotation, a difference that may be related to the amount of organic matter returned by the crops. In the cotton-corn rotation considerable organic matter in the form of corn stalks is returned. The peanut crop furnishes practically no organic matter. The results of this experiment indicate that growers who are using a two-year cotton-peanut rotation probably are not securing maximum cotton yields.

Stands:

Cotton thinned to three plants per foot of row produced 501 pounds per acre more seed cotton than cotton thinned to one plant per foot (Figure 3). Individual plants were larger when the plants were left one foot apart, but the total yield was smaller. Careful thinning and weeding help to obtain the stands needed for top yields.

Fertilization:

Cotton grown on typical cotton soils has been found to respond to as much as 80 pounds of nitrogen when good insect control measures are used (Figure 4). This is equivalent to the nitrogen in 600 pounds of 5-10-10 plus 300 pounds of nitrate of soda. The effect of nitrogen in increasing the number of bolls is shown in Figure 5.

In the past, growers have hesitated to use high rates of nitrogen because of the possibility of increased damage from insects. With the improved insecticides now being used, however, profitable returns can be obtained from more nitrogen. Of course, on dark soils and after legumes less nitrogen in the fertilizer is required.

In all the studies on rate-of-nitrogen, complete fertilizer was used at planting. The phosphate and potassium requirements of cotton have received considerable attention in past experiments. These requirements generally can be met by the use of proper grades of fertilizer at planting. Sometimes it it necessary to sidedress with additional potash, however.

Figure 1.

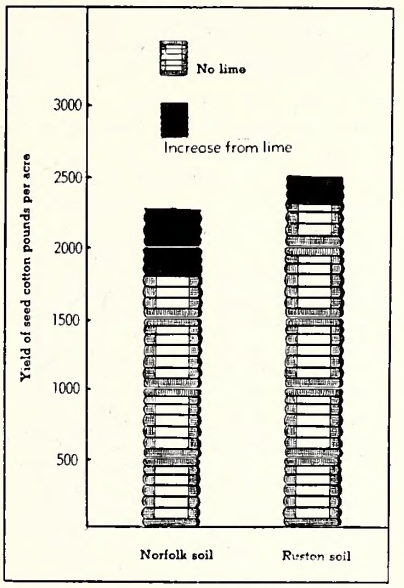


Figure 2.

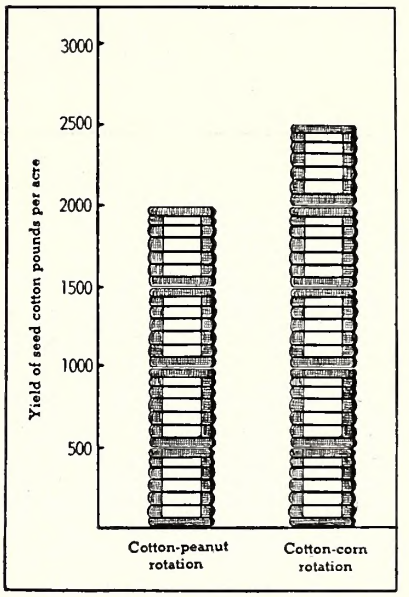
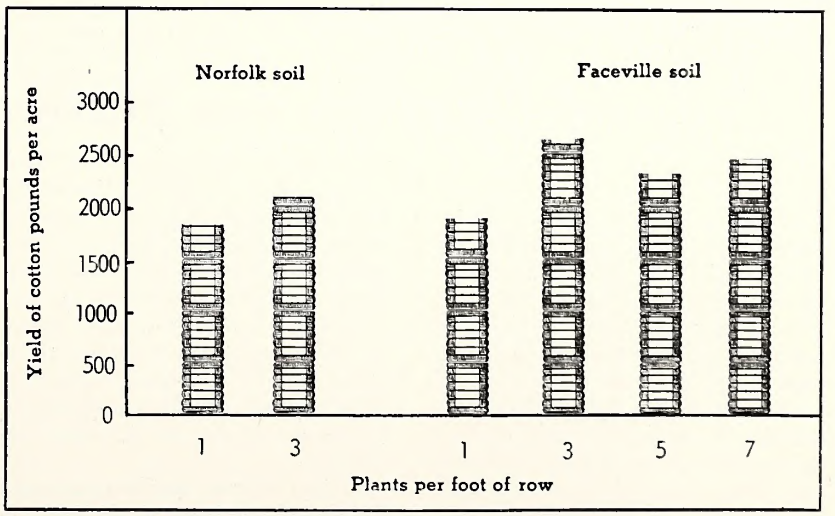


Figure 3.



The cotton yield increase that can be expected from the addition of lime depends on the soil type as shown at the upper left. At the upper right a cotton-corn rotation yielded a bale more per acre than a cotton-peanut rotation. The number of plants per foot of row may increase the yield considerably (bottom).

Figure 4.

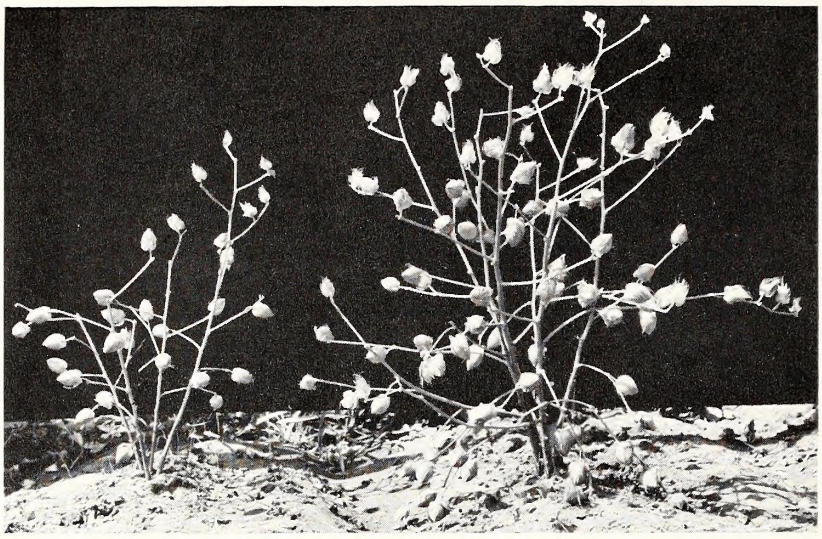
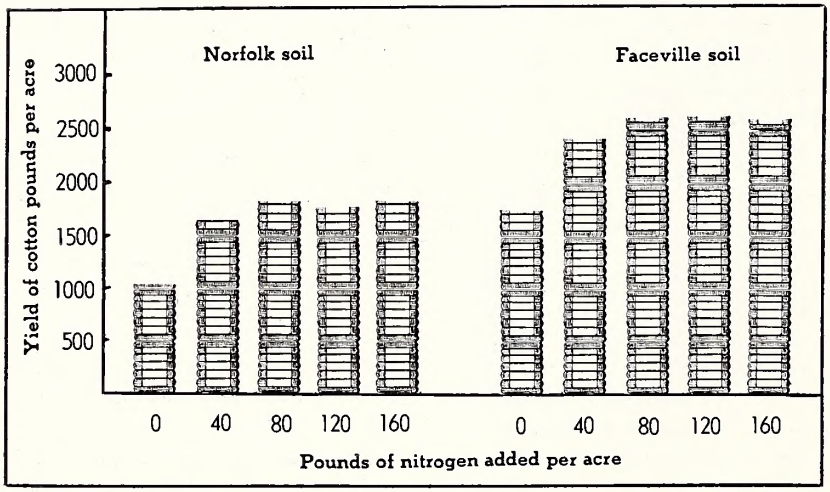


Figure 5.



The plant on the right (above) received adequote nitrogen and developed almost three times as many bolls as the nitrogen-starved plant on the left. Shown below are the yield increases resulting from the use of nitrogen on two soil types.

Need at Least Three Plants Per Hill for Highest Yields

Spacing experiments with the Coker 100 Wilt and Wilds variety indicate that at least three plants per hill or linear foot of row are needed for highest yields and early opening, according to results obtained at the Upper Coastal Plain Station by P. H. Kime and Thomas Kerr.

The hills were spaced 12 and 18 inches apart, some being thinned to two and four plants per hill and others left unthinned. Other plots were seeded in a continuous drill and left unthinned. The final stand for the latter method of seeding was three to four plants per linear foot of row.

Kime and Kerr found a slightly higher percentage of the crop was open at first picking on plots having three or more plants per hill or linear foot of row. Length, strength, and fineness of the fiber were affected very little by spacing or number of plants per hill.

The fiber from the second picking of the Wilds variety was 1/16 to 3/32 of an inch shorter and somewhat finer than from the first picking. The strength was reduced very little in spite of the fact that the fiber was badly weathered. The fiber of the Wilds variety was 12 per cent stronger than the Coker 100 Wilt variety. On the other hand, the Coker 100 produced 28 per cent more seed cotton than Wilds.

Insecticides Prove More Effective in Dust Form

Dust applications of two different insecticides proved more effective in controlling boll weevils than liquid concentrate treatments with the same insecticides, according to Walter M. Kulash, who conducted the tests.

Chlordan and toxaphene formulations were the insecticides tested. In the case of both dusts and liquids, the material was applied at the rate of two pounds of active ingredient per acre. For chlordan, this meant a 20 per cent dust applied at the rate of 10 pounds per acre, whereas the 25 per cent chlordan emulsion concentrate was used at the rate of four quarts per acre.

Dusts were applied with rotary type hand guns. The liquid concentrates were applied with airplane equipment. This consisted of a boom with four nozzles on the underside of each wing. The liquid at the nozzle was forced out at about 80 pounds pressure. The forward motion of the plane served to break up the spray into fine droplets.

Kulash believes that the apparent advantage for the dusts may be due to factors other than the physical or chemical characteristics of the formulations used. The method of application may have been the main reason for the superiority of the dusts.

In the case of the liquid concentrates, applications were not always made at a low enough level to insure good coverage of the plant. Furthermore, the force with which the liquids were applied did not permit good coverage on all parts of the plant. The top leaves got a fairly good coverage, but the center and bottom leaves did not. A much more thorough and complete coverage of the plant was obtained with the hand applications of the dusts.

DELINTING SEED BOOSTS YIELDS

Cotton seeds from which the linters have been removed are known to germinate and emerge more rapidly than fuzzy seed when dry soil conditions follow planting. To determine if this earlier emergence results in an increased yield, S. G. Lehman made two experimental plantings in 1948.

One lot of Coker 100 Wilt-resistant seed was divided into three portions. The reginned seed was prepared by running one portion through a delinter gin, removing about half of the linters. The delinted seed was prepared by removing all the linters with sulphuric acid. The third portion was planted in its natural, fuzzy condition.

As the seed came up emergence counts were made at short intervals. In the first planting, made April 22, germination and emergence were very slow because of unusually dry weather. In this planting the total emergence of the delinted seed was seven per cent higher and the reginned seed eleven per cent lower than the fuzzy seed.

In the second planting, made May 11, only moderately dry conditions prevailed and emergence followed a more nearly normal pattern. In this planting total emergence of reginned seed was nine per cent higher and delinted seed 19 per cent higher than for fuzzy seed.

In both plantings, the delinted seed required the least time to come up. Also in both plantings, the reginned seed came up more rapidly than the fuzzy seed. In the first planting on the day when emergence for the fuzzy seed was 30 per cent of its maximum, the reginned seed had attained 45 per cent and the acid-delinted seed 75 per cent of its total emergence. Differences were found in the second planting.

In the first planting, the reginned and delinted seed lots produced 52 and 265 pounds more seed cotton per acre respectively, than the fuzzy seed. In the second planting, increases of 48 and 103 pounds per acre, respectively, were obtained from reginned and acid delinted seed.

Metaphosphate Best on Cotton

At the present time fertilizer phosphorus is sold in a number of different forms. There is ordinary superphosphate, ammoniated superphosphate which contains three to five per cent ammonia, calcium metaphosphate, dicalcium phosphate and tricalcium phosphate. Each of these materials has its peculiar merits from the manufacturing standpoint.

By using the radio-active isotope of phosphorus, N. S. Hall, W. L. Nelson, and C. D. Welch conducted studies of different sources of fertilizer phosphorus for cotton. The soil, a Norfolk sandy loam, was relatively high in soil phosphorus, and no differences in yield resulted. However, by "tagging" the phosphorus in the fertilizer it was possible to show the difference between these compounds.

None of the materials proved superior to superphosphate at the very early stages of growth. Later in the season, the calcium metaphosphate was vastly superior, and the dicalcium equally inferior.

Chemicals Aid in Weed Control

The use of chemicals for weed control compared favorably with mechanical methods of cultivation in young cotton at Rocky Mount in 1948. E. N. Scarborough found that the chemical treatment eliminated mechanical cultivation for the first five weeks of the growing season and reduced the number of weeds seed germinating during the rest of the season.

The best weed control resulted from spraying with Sinox-W (ammonium dinitro secondary ortho butyl peneate) just before the cotton came up. This pre-emergence spraying at the rate of five pounds per acre gave the highest yield (2330 pounds of seed cotton per acre) of all chemically-treated or mechanically-cultivated plots.

A mechanical thinner, followed by the use of a rotary weeder in the drill when the cotton was small, eliminated much of the need for hoeing by hand. The same was found true when pre-emergence spraying was followed by the use of a mechanical thinner.

Mechanical Pickers Mean New Problems

Cotton growers trade backache for headache, when they change from hand to mechanical harvesting, say J. Gwyn Sutherland and H. B. James.

In 1948 approximately 16 cotton pickers and 35 mechanical strippers were operated in the State. Records kept on these machines show considerable variation in economy of operation and what might be called varying degrees of success in the economical harvesting of cotton. In all cases numerous problems were encountered. The mechanical harvesting of cotton is still in the experimental stage in North Carolina, and many problems remain to be solved. The more important of these are:

Adverse weather conditions make it difficult to operate mechanical harvesters. When rainy conditions prevail during the fall, picking operations may be delayed until the cotton is damaged. Use of mechanical harvesters may be prevented entirely.

Heavy growth of weeds and grass interferes with mechanical harvesting of cotton. If grassy areas in the field are skipped it slows up harvesting and means more cotton to be picked by hand. If grass is picked with the cotton, the grade is lowered.

Mechanical harvesting lowers the grade. Preliminary results indicate that mechanical stripping will lower the grade by about two grades, while mechanical picking will lower the grade approximately one grade. This is true where modern cleaning and boll extracting equipment is available. Poor ginning equipment means a further lowering of the grade.

Size and shape of fields are not suited to mechanical harvesters in some areas. Large fields with long straight rows are best. Rocks, stumps, terraces, and other obstacles interfere with mechanical harvest. Rows must be a uniform distance apart and the cotton less than forty inches tall for the stripper to work satisfactorily.

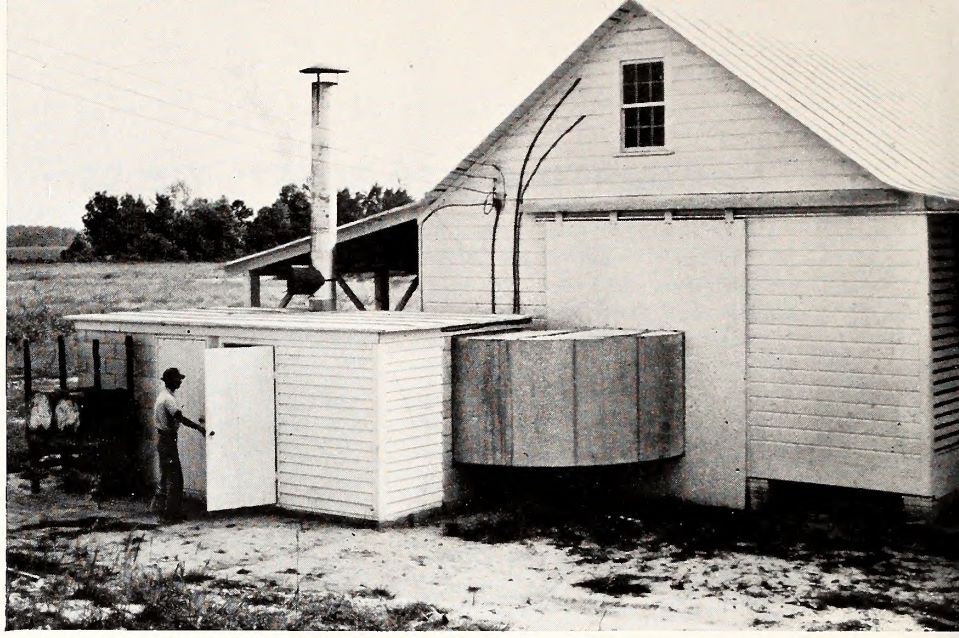
Good cleaning and ginning equipment must be available for mechanical harvesting to prove satisfactory.

Engineers Build, Test New Seed Corn Dryer

A new type of seed corn dryer has been built and tested by J. W. Weaver, Jr., and S. H. Usry in cooperation with a commercial seed farm in eastern North Carolina. The dryer has a capacity of 10,000 bushels of seed corn in three weeks time. By installing additional drying bins the capacity can be increased to 20,000 bushels in three weeks.

Air for drying is heated and controlled automatically by a locally-made oil burning heater. A large fan, driven by a water-cooled gas engine, forces the drying air horizontally through two rows of bins. The tops of the bins are open and the sides are slatted. The floors and partition walls between bins are air tight. A 10-foot driveway extends through the building between the two rows of drying bins. Canvas curtains on the bin walls next to the driveway are rolled up or down to control air flow.

The slatted bin walls next to the driveway can be removed so that the bins can be used for storing seed, fertilizer, feed or other materials when the dryer is not in use. This method of bin construction requires about 60 per cent of the materials needed for similar bins with tight walls all around.



Forcing air horizontally through the bins of this seed corn dryer on the Speight-Davis farm near Pollocksville saved 40 per cent in bin construction costs.

Study Shows Need for More Off-Farm Drying, Storage

When S. H. Usry began an engineering study of commercial drying and storage facilities in July, 1948, there was only one commercial grain dryer in operation in the State. By December, 1948, four dryers were in operation, and five more proposed installations were scheduled to be in operation within a year. These new dryers will be associated with corn and small grain storage facilities ranging from 30,000 to 100,000 bushels capacity.

Tests are now being conducted to determine the safe moisture content of corn and small grain for bulk storage under North Carolina conditions.

New Southern Hybrids Show Marked Weevil Resistance

Weevil resistance of the grain is of first importance in corn strains to be grown in the South. Hybrids in production today vary in the degree of susceptibility to weevil damage, but none adapted to North Carolina are highly resistant. Tests conducted in the lower Coastal Plain by P. H. Harvey show clearly that experimental hybrids now under test are much more resistant to weevil damage than either farm varieties or commercial hybrids.

In 1948, Dixie 18 a yellow hybrid adapted to southern Georgia, showed only 5 per cent weevil damaged ears, where, in comparison, the best farm variety showed 52 per cent weevil damaged ears. Other experimental hybrids which showed good resistance are N. C. 8102 with 6 per cent infested ears, Gcp 7105 with 9 per cent, Mp. 6117 with 11 per cent and SC. 8201 with 24 per cent infested ears.

While all of these hybrids produced more grain than the check farm variety, only SC. 8201 produced as much grain as Dixie 17 and N. C. 27. Probably no one of these hybrids is well enough adapted to North Carolina conditions to be used commercially. However, from a plant breeding viewpoint it is important to know that such resistance does exist and that with further breeding it can be combined into hybrids suited to local conditions.

Hybrids Reach Million Mark

The production, processing and selling of hybrid corn seed became a $1,000,000 business enterprise in 1948.

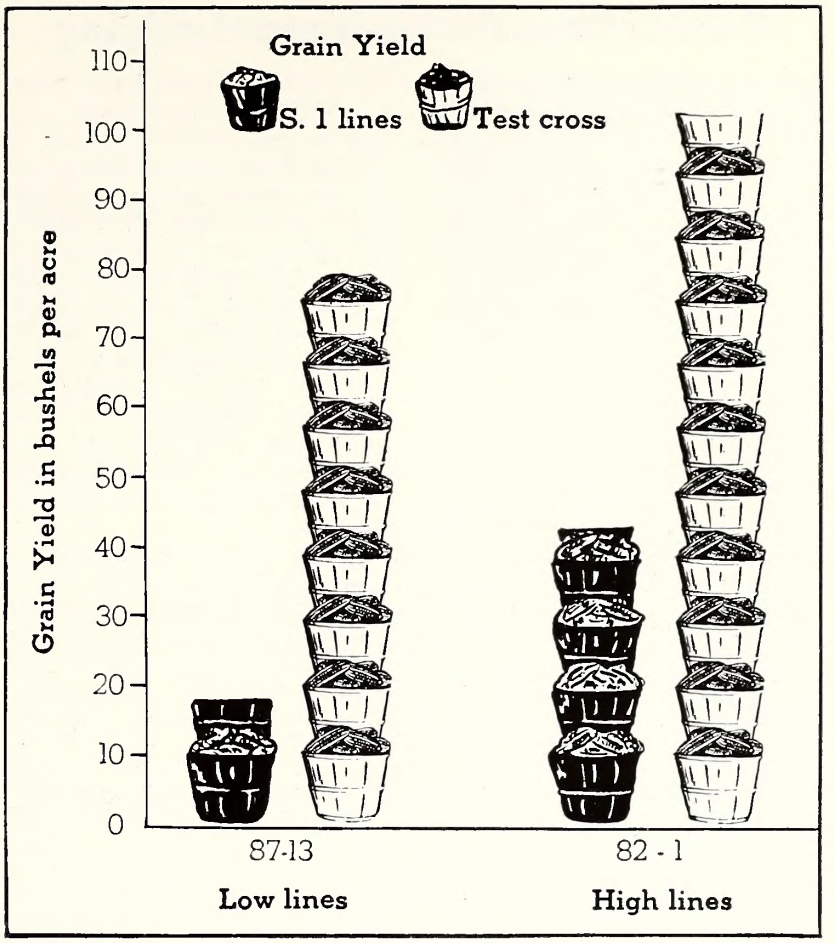
From a mere beginning of 67 acres in 1944, seed farmers have increased the production to 3900 acres in 1948. An estimated 97,500 bushels of hybrid seed corn was grown for planting in 1949. With a retail price of $10.50 per bushel for hybrid seed corn, a total value of over one million dollars can be ascribed to the 1948 seed crop.

The N. C. Crop Improvement Association under the direction of R. P. Moore has been largely responsible for this rapid growth in production of hybrid strains released by the Experiment Station.

Drilling Beats Hill Planting

The conventional drill method of planting corn yielded slightly better than hilled dropped corn at equal plant stands in tests by B. A. Krantz. However, Krantz reports, there was slightly less stalk lodging in the hill dropped corn.

In these six field experiments the corn was planted in hills varying from one to five plants per hill. The data indicate that the conventional method of drilling corn with single plants uniformly spaced is as good, or better than, any method of hill dropping used.



The vigor of corn inbred lines is closely reloted to the yielding obility af resulting hybrids. Shown in black are representative "high" and representative "low" inbreds. The yield of resulting hybrids is shown beside each.

Yield of Corn Hybrids Related To Inbred Vigor

Studies made during the past three seasons show a strong relationship between the vigor of the inbred breeding stock and the grain yields of resulting hybrids.

P. H. Harvey made 200 test cross hybrids in 1946 and tested them in 1947. Grain yields from these varied from a low of 71.3 bushels per acre to a high of 102.9 bushels per acre. In 1948 Hervey selected five of the lowest yielding test crosses and five of the highest yielding test crosses for further testing.

The five lines representing the low group of test crosses averaged only 53 grams of grain per plant whereas the five lines representing the high group of test crosses averaged 103 grams of grain per plant. These results give the plant breeder more assurance that his selection among new inbred lines for plant vigor will result in better corn hybrids without making test crosses during the early stages of breeding.

New Corn Breeding Stock Resists Leaf Spot Disease

A new corn disease, Helminthosporium carbonum, was observed in the breeding nursery in 1945. It proved to be very destructive to those inbred lines which were susceptible. Since one such inbred line is used as a parent to Dixie 17 hybrid it was desirable to develop a resistant form of this inbred line, namely NC 37.

During 1948 J. B. Pate and P. H. Harvey inoculated 109 backcross progenies (now S.4 lines) and found 38 of these progenies to be completely resistant to the disease. These 38 inbred lines have all been crossed so that their hybrid performances can be tested in 1949. Thus by the use of winter crops in the greenhouse and artificial inoculation with the disease during the last four years several new forms of the parent inbred NC 37 have been developed all of which are completely resistant.

Hybrids Yield Well Despite Dry Weather

Those areas affected by drought in 1948 produced more corn per acre than the ten-year average production prior to 1940. Two factors contributed to this good production under very droughty conditions—the use of more hybrid corn seed and the use of better cultural and fertilizer practices.

Five N. C. Certified hybrids averaged 49 per cent more grain than the two check farm varieties in five tests conducted in the drought areas by H. L. Cooke, R. P. Moore, and P. H. Harvey. Dixie 17 produced 75 per cent more grain than the farm varieties in these trials. It was the highest grain-producing hybrid tested under drought conditions. The other four hybrids in descending order of their grain yield were Tenn. 10, N. C. 27, N. C. 26 and N. C. T20.

Potash Does Not Increase Lodging

It is a well known fact that a low potash condition can lead to considerable stalk breakage and lodging in corn. In an experiment conducted by B. A. Krantz a normal potash application (40 to 80 pounds K_2 per acre) reduced lodging, and also increased the yield.

However, in a companion test, Krantz found that heavy applications of potash (160 or 320 pounds of K_2O per acre) had no effect on either yield or lodging beyond that of the normal application. There was no difference between plots where the potash was broadcast at planting time or where it was broadcast and plowed under six weeks before planting. The yields in these experiments ranged from 83 to 133 bushels.

On a high-potash soil heavy potash application increased the potash content of the corn leaves, especially during the latter stages of growth. The total potash content of corn leaves from plots receiving 0, 80, 160, and 320 pounds K_2O per acre plus adequate nitrogen and phosphorus was 1.76, 2.08, 2.37, and 2.69 per cent respectively.

On a low-potash Bladen soil, the potash content of the corn leaves from plots receiving 0, 60, and 120 pounds of K_2O per acre was 0.62, 1.42, and 1.75 per cent K_2O respectively. The respective corn yields were 76.2, 113.7, and 128.0 bushels per acre, and stalk lodging was decreased by the potash application.

As the nitrogen levels were increased from 0 to 160 pounds of nitrogen per acre, the potash content of the corn leaves was increased at all potash levels. Apparently this "luxury consumption" of potash did not influence lodging.

Liquid Ammonia Compares With Solid Nitrogen Forms

Anhydrous ammonia was found by B. A. Krantz and E. N. Scarborough to be equal in ammonium nitrate as a source of nitrogen for corn. The test materials were used at four comparable rates of application on two soil types.

Anhydrous ammonia is ordinary ammonia gas compressed into the liquid form under pressure from 75-175 pounds per square inch. It contains 82 per cent nitrogen, weighs about 5 pounds per gallon and contains 4.1 pounds of nitrogen per gallon.

In the two experiments the anhydrous ammonia was applied with special tractor-mounted equipment consisting of a high pressure tank, safety valves, a metering device, and high pressure rubber tubes leading to the knife blade applicators. Both materials were placed six inches deep in the row middles when the corn was three to four inches high. Krantz and Scarborough report that they could detect no loss of ammonia vapors immediately after application even where used at the high rates.

Although crop response to anhydrous ammonia appears to be good, further research is needed.

CORN ON BOTTOMLANDS RESPONDS TO NITROGEN

Application of 160 pounds of nitrogen per acre to corn brought an increase in yield of 90 bushels per acre in an experiment on typical mountain bottom soil (Congaree silt loam) which had been cropped previously to corn and vegetables.

In this test, B. A. Krantz planted hybrid U. S. 282 at a stand of 14,000 plants per acre. He supplied adequate phosphorus and potash. The yields from plots receiving 0, 40, 80, 120, and 160 pounds of nitrogen per acre were 32.3, 67.9, 95.5, 113.1 and 122.3 bushels per acre, respectively.

In a typical upland mountain soil (Balfour silt loam) which contained enough nitrogen to produce 81.7 bushels per acre without fertilization, the yield was increased to 133 bushels by nitrogen fertilization. This indicates effective utilization of nitrogen even on the high nitrogen soils.

The protein content of the grain was also greatly improved by nitrogen applications. On the Congaree soil the protein content was boosted from 5.8 to 8.9 per cent by nitrogen application. On the Balfour soil it was increased from 7.4 to 10.1 per cent.

Insects Damage Corn Seriously During 1948

Insect damage to corn in 1948 was probably more serious than it had been for several years, according to Walter M. Kulash. Persistent and continued attacks on the young stages of corn by several insect pests were the chief cause of damage. Conditions were typical in Hyde County where corn seed or young seedlings were eaten either by (1) rootworms, (2) wireworms, (3) cutworms, or (4) armyworms.

Rootworms

In small plot tests with eight different insecticides for southern corn rootworm control, Kulash found that many of the new organic insecticides were effective. These materials included DDT, benzene hexachloride, chlordan, parathion, toxaphene, ditolyl trichloroethane, and methoxychlor.

Most of these materials, dusted into the furrow just ahead of corn planting, significantly reduced the number of rootworm-damaged plants. The amount of active ingredient used per acre varied from 0.2 pound of gamma isomer of benzene hexachloride (as technical grade) to 10 pounds per acre DDT. None of the materials had any retarding effect on the germination or rate of growth of corn. DDT, however, is the only material of the ones tested that can be recommended generally for control of the rootworm in the manner described.

Wireworms and Cutworms

The most striking damage caused by wireworms and cutworms during 1948 was in Hyde County where a 12-acre field had two spots of about three acres each where the corn was completely destroyed. In some places as many as 40 wireworms were found feeding on the roots of one plant. One wireworm per plant (up to a plant height of 20 inches) usually is enough to kill the plant.

Two field tests with "broadcast" applications of the new organic insecticides were conducted at Wilmington (New Hanover County) and at Swan Quarter (Hyde County). The dusts were applied to the surface and disced or harrowed

(Continued on next page)

Insects Damage Corn

(Continued from page 30)

into the soil at three months before planting as compared with applications made in March, a week to 10 days before planting. The results clearly demonstrated that March applications of DDT, benzene hexachloride, chlordan and a combination of DDT and benzene hexachloride were more effective in protecting corn from cutworm attacks than applications made three months before planting. In both localities, invasions of cutworms interferred with tests for wireworm control.

Armyworms

In many areas, corn that was not attacked by cutworms suffered some damage from armyworm attacks. Fields in several eastern North Carolina localities were completely wiped out.

For control in corn, Kulash found 5 to 10 per cent DDT at 15 to 20 pounds per acre to be effective. Lower dosages of DDT, when properly applied, will control the smaller worms. But when the worms are larger and begin to eat the buds of corn, the 10 per cent material is recommended.

DDT and benzene hexachloride should not be used for armyworm control on any grass or forage crop that is to be used for animal feed within four to six weeks after treating.

Some Soil Insecticide Problems

The indiscriminate use of the new organic insecticides for control of soil insects has posed several problems, says Kulash. For intance, little is known about the effect of undesirable poison residues upon flavor of root-crops, upon plant growth or upon the microfauna and microflora of the soil. Technical grade benzene hexachloride, especially at higher dosages, has been responsible for off-flavor in Irish potatoes and other root crops. Hence it cannot be recommended generally for soil pest control, especially for pests of root crops.

Combinations of insecticide and fertilizer for use as a soil insecticide for crop pest control are still in the experimental stage.

2,4-D Gives Good Results on Corn

Pre-emergence applications of 2,4-D gave excellent control of weeds in all pre-emergence tests on corn conducted by G. C. Klingman in 1948. "Pre-emergence" refers to the application of the chemical before the crop breaks through the surface of the ground—usually five to eight days after planting in the case of corn.

The pre-emergence treatments gave excellent control of weeds for the first seven to eight weeks on heavy soils and for approximately five weeks on sandy soils. After this period the 2,4-D was no longer toxic.

Seoson Control

On several preliminary trials, Klingman made a second application with ¾ pounds of 2,4-D acid six weeks after the pre-emergence application. In so doing, he kept the spray off the corn as much as possible. In each case, this treatment extended weed control through the season. There was some twisting of the corn plants, but the yield was unaffected.

Klingman concludes that pre-emergence treatment appears to have a promising future, but its best use may be in combination with a lay-by cultivation or with post-emergence treatments.

Sotisfoctory Treotments

"Post-emergence" treatment designates the spraying of green and growing crops for weed control. Corn, the small grains, grass pastures and lawns can be treated satisfactorily in this manner, since they have a tolerance for the chemical.

Klingman recommends a post-emergence application wherever cocklebur, annual morning glory, ragweed, pig weed and most other annual broadleaved weeds in corn are not controlled by cultivation of pre-emergence chemical treatment.

The post-emergence treatment should be made when the corn is from 12 to 36 inches tall. Klingman warns against treating immediately preceding or during pollination. Post-emergence treatments are not recommended where the population of grass weeds is high.

Deep planting is important when using 2,4-D on corn. The plont on the left wos grown from seed planted ¼ inches deep; the one ot right, 1¼ inches deep.

Mulch Conserves Soil Moisture

The soil moisture content of mulched corn was consistently higher than that of unmulched corn throughout a droughty season on a Cecil clay loam soil B. A. Krantz reports that the mulched plot with its greater supply of soil moisture yielded 94.9 bushels per acre as compared with 49.9 bushels of the unmulched plot.

The results indicate that the soil in the mulched plot dried out more slowly than that of the unmulched plot, apparently tiding the plant over short drought periods. Also, the soil in the mulched plot appeared to be wetted more by a moderate rain than was the unmulched soil.

The unmulched plants wilted and rolled several times during the season and dried up prematurely in early September, while only slight wilting occurred in mulched plots.

LIVESTOCK AND POULTRY

DAIRYING

ORTHO DILUTER PERFORMS WELL

The Ortho semen diluter is approximately equal to standard diluters now used by artificial breeding associations, F. I. Elliott, T. C. Blalock and A. L. McLoughlin conclude on the basis of laboratory and breeding studies.

The Ortho diluter has the advantage that the operator need not prepare buffer or egg yolk. He merely adds the semen sample to a measured amount of the diluter taken from a sterile bottle.

Bacteriological studies carried out with the assistance of M. L. Speck, showed that there is little growth in any diluter at refrigerator temperature. When the semen sample is warmed up, however, considerable bacterial growth goes on unless some antibiotic (e.g. "sulfa" drug) is present. Sulfasuzidine, the "Sulfa" drug of the Ortho diluter, is as effective in this respect as in sulfanilamide, the drug being used by many artificial breeding associations.

Spermatozoa maintained a higher motility rate for the first four or five days of storage in the Ortho diluter than in the usual egg yolk-citrate-sulfanilamide diluter with which it was compared. However, semen looked better in the latter diluter after 10 days in storage.

The field breeding studies were carried out in cooperation with the Forsyth County Breeding Association, County Farm, Winston-Salem. Each semen ejaculate was divided, one half being diluted with the Ortho diluter and the other half diluted with egg yolk phosphate.

Semen diluted in Ortho diluter was used during September, October and November to inseminate 182 cows which were being bred for the first time since calving. One hundred and forty-eight of these cows had not returned for service within 30 to 60 days. This gives a "non-return" percentage for Ortho diluter of 81.3.

Of 172 first-service cows bred during the same period with the same semen samples in the egg yolk-phosphate diluter, 146 had not returned for service within 30 to 60 days, giving a "non-return" percentage of 84.9.

The difference is probably not significant, but it is interesting to note that it was during November that the largest difference appeared: 68 per cent for Ortho and 80 per cent for egg yolk-phosphate.

Willard Jersey Herd Reaches 8,000-Pound Milk Average

Twenty-five cows in the purebred Jersey herd at the Coastal Plain Station completed ten-month records averaging 8010 pounds of milk and 464 pounds of fat during 1948, according to E. W. Faires and R. K. Waugh.

The average increase in production was 649 pounds of milk and 64 pounds of fat, the records show. Some daughters of the third proven sire came into production and appear promising. However, 1949 records will be needed to make a good comparison between this third proven sire and the two used previously.

Cows are milked twice daily and are bred for ten months' lactation. Improved pastures account for much of the increase in production. Pastures were no better during 1948 than 1947, but the cows were grazed over a greater part of the year.

Keep Calves Off Pasture To Reduce Parasite Menace

A study of the parasite infestation of calves on pastures has led C. D. Grinnells and J. L. Moore to three main conclusions: (1) calves under ten months of age should not be turned on pasture; (2) calf pastures should be rotated to reduce the parasite intake; and (3) calf pastures should be grazed part of the time by horses, mules or by mature cattle.

Parasite populations build up very rapidly on calf pastures, the investigators found. The increase was most rapid on heavily grazed plots, these showing almost double the parasite population as the lightly grazed plot.

Calves under ten months are extremely susceptible to parasite attack. Rotating pastures and grazing them with mature animals cuts down the population. Mature cattle have an age immunity.

Dry Ice Used to Ship Semen Long Distances

Dry ice may be of considerable value as a refrigerant in shipping bull semen over long distances report F. I. Elliott, T. C. Blalock, A. L. McLaughlin, and H. A. Stewart.

During the summer of 1948 six semen shipments were made from Colombia, South America, to Raleigh on a beef cattle breeding project. The packages were in transit from 45 to 179 hours. A shipping container designed at the Missouri Station was used. The temperature of the semen on arrival was too high in all cases. Since that time, a study comparing the brine pad plus ice (the Missouri method) with various other refrigerants, has been in progress.

Replacing the brine pad of the Missouri container with two pounds of dry ice increased by 20 to 30 hours the time during which the temperature remains low enough. The dry ice did not cause the temperature to go below 33.5° F. at any time.

If dry ice or a sub-zero freezer is not available, a pan of water frozen in a domestic refrigerator will hold the temperature more satisfactorily than the brine pad "frozen" in the refrigerator.

The apparatus used in making temperature readings, permits readings without the packages being opened.

Dried Sweet Potatoes Rated High as Feed

In an experiment conducted by E. W. Faires and R. K. Waugh at the Coastal Plain Experiment Station, a dairy cow ration consisting entirely of southern feeds was found to be as satisfactory for milk production as a more conventional ration.

The ration of southern feeds was made of citrus pulp meal, 375 pounds, dehydrated sweet potatoes, 375 pounds, peanut meal, 125 pounds, and cottonseed meal, 125 pounds. This ration was compared to one made of 400 pounds of corn, 300 pounds of oats, 200 pounds of wheat bran, and 100 pounds of cottonseed meal.

The southern ration was not only equal in feeding value when fed to milking cows but was considerably cheaper at the time of the experiment. Farmers should not hesitate to use such feeds as dehydrated sweet potatoes and citrus meal if costs of these ingredients are low.

Cows sometimes need to be taught to eat citrus meal. However, no difficulty with palatability should be encountered if citrus meal is limited to 300 or 400 pounds per ton. Since citrus pulp meal is somewhat bulky but contains a fairly high amount of total digestible nutrients, Faires and Waugh suggest that it be used as a partial substitute for both oats and corn.

Calves Develop Fatty Livers

Dairy calves fed on purified diets containing either hydrogenated or nonhydrogenated cottonseed oil developed fatty livers, in the 1948 feeding trials conducted by R. K. Waugh and R. N. Jarvis. The purified diets are valuable for experimental work because they make it possible to withdraw or add known nutrients at will.

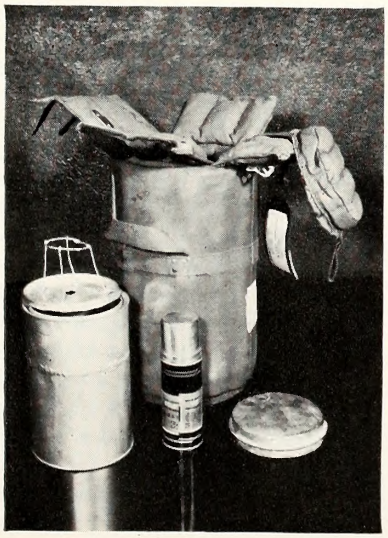
The hydrogenated cottonseed oil did not cause fatty livers when fed with reconstituted skim milk. Therefore, some part of the purified diet other than the fat is probably responsible for the fatty livers, Waugh and Jarvis conclude.

Penicillin-Sulfa Tests Made

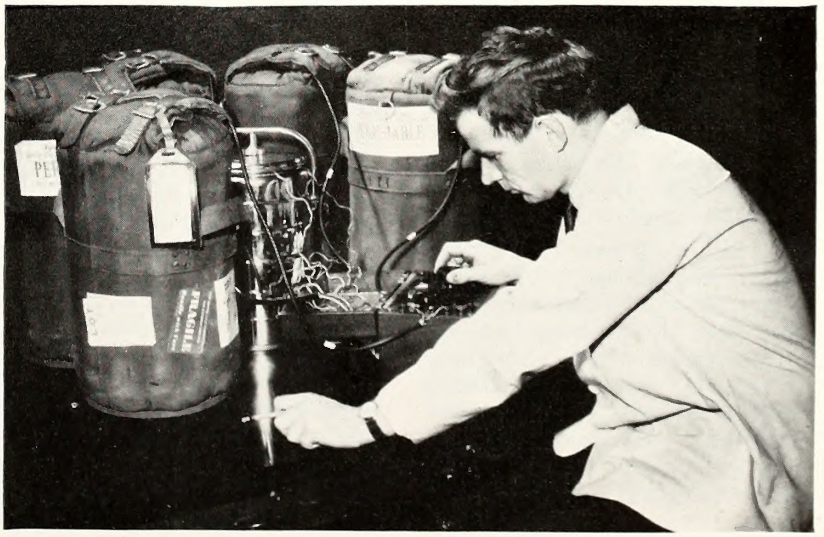
Combinations of penicillin with sulphamerizene and Penicle (a liquid petrolatum lanolin preparation) gave better results than penicillin in water as infusion treatments for mastitis. The studies were conducted by C. D. Grinnells, J. L. Moore, and W. Cranor.

With few exceptions the dosage was 100,000 Oxford Units of Penicillin in all three treatments. The treatment was added to 50 c.c. of vehicle and infused into the udder with a hypodermic syringe. The combination of penicillin and sulfonamides produced better clinical and bacteriological results than penicillin alone.

This is the Missouri long-distance shipper used for shipping semen.



A technician uses a measuring instrument to check the temperature of shipping containers. The instrument permits readings without the packages being opened.

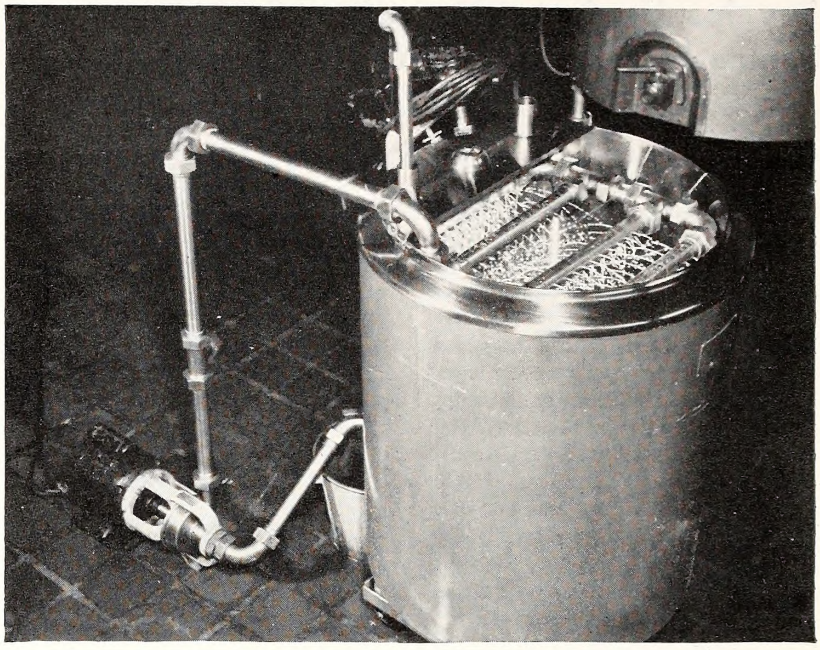


Forced Air Removes Feed Flavors in Milk

Several different types of feed flavors can be removed from milk by blowing air through it, according to W. M. Roberts, F. M. Haig, and M. L. Shumaker who have completed several trials of the new method.

The process consists of heating the off-flavored milk to 150 degrees F., and blowing filtered air through it until the flavor is removed. This usually requires from 20 to 60 minutes, depending on the intensity of the off-flavor. It is necessary to spray milk by circulation into the vat so that the foam which forms can be dispersed. After the flavor is removed, the milk is homogenized at 2500 to 3000 pounds per square inch pressure and cooled.

Practically all volatile feed flavors are eliminated by this treatment. The milk has normal keeping qualities. From 3 to 8 per cent of the water is lost by evaporation.



This is the apparatus used for removing undesirable flavors fram milk. The milk was heated to 150 degrees F. ond filtered air was blown through it from 20 to 60 minutes. The treatment removes practically all objectionable feed flavars.

Roughages Limit Need For Feed Supplements

Home grown roughages with limited amounts of protein supplements during the winter and good pastures during the summer furnish ample nutrients for maturing dairy heifers, according to C. D. Grinnells and J. L. Moore.

Ten dairy heifers of the Ayrshire breed were fed all the sorghum silage they could clean up. Five were fed a supplement of two pounds of cottonseed each per day. Five were fed one pound of cottonseed meal per day with five pounds of lespedeza hay each.

The hay group made larger gains though both groups made satisfactory growth. Heifers carried on these home grown rations and now in their third and fourth lactation, are making good records. Dairymen can raise their own replacements with good pastures, ample silage, and a limited amount of good hay and protein supplements, Grinnells and Moore conclude.

New Method for Making Buttermilk from Dried Milk

By using a high grade of non-fat dry-milk solids containing no off-flavors, R. N. Costilow, Marvin L. Speck, and W. M. Roberts found it possible to manufacture a completely satisfactory cultured buttermilk without the use of fresh skim milk. Consumer preference panels rated such a product equal to cultured buttermilk prepared from fresh skim milk.

To manufacture a good cultured buttermilk from non-fat dry-milk solids these additional steps are recommended: (1) The use of 10.0 per cent non-fat dry-milk solids in the product to be cultured; (2) pasteurization of the reconstructed milk solids at 180° F. for 30 minutes; (3) the development of 0.85-0.90 per cent acid in the buttermilk.

The manufacture of cultured buttermilk from milk solids enables a dairy to continue to produce a high quality product during winter months when the supply of fresh skim milk may not be available to manufacture this product.

Poor Timing Destroys Cream Line, Causes Cooked Flavor

Improper timing of H.T.S.T. pasteurizers results in milk that is under-pasteurized or milk which is overheated, thus destroying the cream line and causing a cooked flavor.

In comparing different methods available for measuring the holding time, W. M. Roberts and M. L. Shumaker found the following relationship; Colorimetric, 18.19 seconds; Foxboro electronic timer, 21.15 seconds; automatic Solubridge, 19.70 seconds; and cold injection, 18.38 seconds. These determinations were made on an 1800 pounds per hour H.T.S.T. pasteurizer.

The condition of the milk pump appears to be the most important factor influencing holding time. Other factors which alter the holding time are air leaks, level of milk in the supply tank, pressure on the pasteurized milk, tightness of the press, height to which the milk is pumped, presence of filters, clarifiers, or homogenizers in the line, slope of the holding tube, and the presence of air pockets in the holding tube.

HTST Pasteurization Tried on Chocolate Milk

The high-temperature-short-time pasteurization method was found by Marvin L. Speck, C. D. Colvard, and M. L. Shumaker to be suitable for the pasteurization of chocolate milk.

Micrococcus freudenreichii (No. MS66), a bacterium having heat resistance somewhat greater than the most heat-resistant pathogenic bacteria, was used to determine the heat treatment needed to pasteurize non-settling chocolate milk with safety. Difference in the per cent sugar, stabilizer, and added non-fat dry milk solids had no appreciable effect on the heat treatment required to kill the test organism.

In comparing the resistance of *M. freudenreichii* in chocolate milk of different compositions and in whole milk, no differences were observed at 165° F., 160° F., and 155° F. At 150° F., 145° F., and 143° F., longer exposures were required to destroy the test organism. The standard for the holder method of chocolate milk pasteurization as contained in the Milk Ordinance and Code of the U. S. Public Health Service, is therefore questionable.

Preliminary experiments using a commercial HTST plate pasteurizer showed that temperatures of 161° F., 168° F., and 175° F. for 19 and 40 seconds reduced the total bacterial count of chocolate milk an amount comparable to that obtained by pasteurization at 145° F. for 30 minutes. The results indicate that the final selection of a time and temperature for HTST pasteurization of chocolate milk may depend as much upon the physical properties desired as upon the minimum times and temperatures required to give satisfactory reduction in bacteria count.

Haywood Study Reveals Cost Of Converting to Grade A

Capital required to convert to the production of Grade A milk ranged from $1559 to $2557, according to a study made in Haywood County in 1948, by T. K. Jones and H. B. James.

The cost of a six-stanchion barn made of concrete blocks was $1611; cinder block, $1429; and lumber, $983. The cost of dairying equipment varied from $576 to $946, depending on the make and size of equipment.

In considering a change to Grade A milk production, the farmer should consider:

The amount of milk which will be produced for sale. Capital expenditures must be kept in line with size of business. The value of converting to Grade A production will be lost if the cost of converting becomes too high in relation to the amount of milk produced.

The permanency of the dairy enterprise and the future size of herd. A milk barn represents a long-time investment. Plans for increases in the number of cows milked should be considered in deciding upon the size, type, and design of the barn to be constructed.

Dairymen Say Milk Production Most Profitable Enterprise

Almost three-fourths of the Grade A dairymen responding to a survey by Walter P. Cotton and John N. Mahan reported that market milk production was the most profitable enterprise on their farms.

One-third of the 520 Grade A dairymen surveyed stated that good summer grazing was one of the major reasons for high summer production and uneven seasonal pattern. Forty-one per cent attributed uneven production to their herds' seasonal calving patterns.

Farmers' recommendations for steps to level out seasonal milk production were as follows:

52 per cent of the recommendations involved breeding for fall freshening, 19 per cent recommended improved fall and winter pastures, 16 per cent recommended heavier grain and hay feeding, 9 per cent recommended early fall feeding of silage.

With respect to the amount of seasonal incentive necessary to encourage uniform milk production, 34 per cent of the dairymen thought that a seasonal difference in price of 75 cents would be enough. An additional 30 per cent thought $1.50 would be necessary.

Egg Products Improve Flavor, Body, Texture of Ice Cream

Egg products improved the flavor, body, texture and consumer preference of ice cream in tests conducted by W. S. Arbuckle and L. F. Blanton.

Products studied included powdered whole eggs, powdered egg yolks, commercial egg blends, frozen whole eggs and frozen egg yolks. The results showed that powdered egg yolks, frozen egg yolks and egg blend products were most desirable for use in the manufacture of ice cream.

The tests were conducted with ice cream mixes where butter and non-fat dry milk solids were the sources of dairy products as compared to mixes where fresh milks, cream and condensed milk were the sources of dairy products.

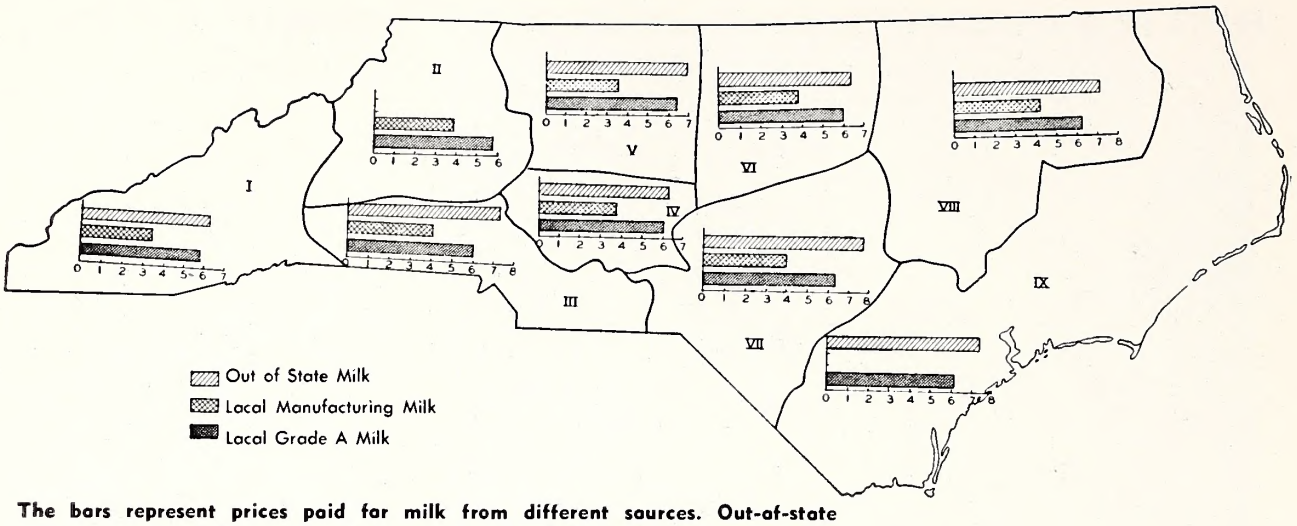
Definite quality differences were produced in favor of the use of eggs, regardless of the source of dairy products when the mix was frozen on the batch freezer. Effects of the use of eggs were less pronounced when the continuous freezer was used.

Use of Emulsifying Agents Improve Ice Cream Quality

Proper stabilization is important in the production of high quality ice cream, according to studies made by W. S. Arbuckle, R. B. Redfern and L. F. Blanton.

In comparison to stabilizers the emulsifying agents, either in combination products or when added to the stabilizer, produced a less viscous mix with improved whipping properties and a finished ice cream with a smoother body and texture. Excessive use of emulsifying agents resulted in an ice cream which had a fluffy body and texture, poor melting qualities, and which was susceptible to shrinkage during storage.

The value of emulsifying agents in the manufacture of ice cream appeared to be mainly with the improved whipping properties of the mix, the production of a smooth body and texture and more exact control in the various manufacturing processes. The advantages were more definite when the batch freezer was used.



The bars represent prices paid for milk from different sources. Out-of-state milk averaged a dollar per hundred more than local Grade A milk.

MILK SUPPLY 20% SHORT OF NEEDS

The year-round supply of market milk production in North Carolina is about 20 per cent short of State requirements for all bottling purposes, reports Walter P. Cotton. Cotton is studying the possibilities of adjusting market milk supplies to needs in North Carolina.

During 1947 winter production represented about 55 per cent of bottled requirements, whereas summer production was equal to about 90 per cent of bottled sales for the State as a whole. Cotton found that the seasonal variation in production has become progressively worse since 1941.

For summer areas and plants, summer production is already exceeding bottled sales. Because of poor distribution, this excess is resulting in lower sale prices and lower incomes for both plants and producers.

Grade A prices to local producers for 4 per cent milk averaged about $6.05 per hundred weight. Local manufacturing milk averaged from $2.00 to $2.25 less, and the cost of Grade A quality milk brought in from out-of-state averaged about $7.25 per hundredweight.

Transportation costs on out-of-state milk in 1948 ranged from 80 cents to $2.20 per hundredweight for milk coming by tank truck from Pennsylvania and Minnesota, respectively.

FALL FRESHENING DOES NOT INCREASE AMOUNT OF FEED CONSUMED, STUDY SHOWS

"Does it require more barn feed per 100 pounds milk produced over a lactation period for cows freshening in the fall than for equally good cows freshening in other seasons?" In an effort to answer this question, Walter P. Cotton analyzed records of 252 individual cows in North Carolina Dairy Herd Improvement Association herds for 1938 and 1947.

For 1938, records from 24 herds scattered throughout the State were used. These were composed about equally of the Jersey, Guernsey and Holstein breeds. Forty-four cows of each breed were chosen at random from these herds, except that each cow was required to be at least three years old, and on test at least 10 months.

The cows were grouped by breeds and seasons of freshening. Their annual production and annual quantities of barn feed consumed were compared.

An analysis of these records failed to show a significant difference in the amount of barn feed fed per 100 pounds of milk produced annually for either the 1938 or 1947 records by season of freshening. There was a significant difference by breeds.

500 Grade A Producers Sell Milk Through Dairy Co-ops

About 500 producers of Grade A milk now sell through milk distributing co-ops in North Carolina, according to a study by Martin Abrahamsen and William T. Wesson. In 1948 an estimated 12 per cent of the milk distributed in the State went through co-op plants.

Special attention in this study was given to organization and operating practices and financial and operating comparisons. Important findings indicate:

1. Farmers selling through co-operatives received 63.7 cents out of the consumers' sales dollar.

2. Processing costs accounted for 18.9 cents of this dollar; selling expense, 13.0 cents; and administrative and general expense, 4.4 cents.

3. Net operating margins averaged 2.7 cents per dollar of sales for all co-ops and ranged from a low of 2.6 cents to a high of 5.8 cents.

4. Total assets amounted to $4.34 for every 100 pounds of milk handled. These findings suggest that managers of co-op milk distributing plants in North Carolina can improve the operation of these associations by giving attention to:

(1) Methods of dealing with variations in seasonal production.

(2) Establishing and maintaining adequate sales outlets.

(3) Encouraging farmers to produce high-quality milk.

Produce Firm Pork with Soybeans

What kind of supplements should be fed to pigs while they are "hogging off" soybeans? F. H. Smith, E. H. Hostetler and W. J. Peterson now have some additional information on this question after five years of experiments with various soybean supplements.

It has long been known that pigs respond well when fed mineral supplements of calcium and phosphorus. Hence, the main problem was whether or not a protein supplement would produce better gains.

Animal Protein Plus Minerals

Each year young pigs weighing about 41 pounds, were arranged ten in a group. Group No. 1 was permitted to "hog off" soybeans in the field, and was supplemented with animal protein and minerals. Group No. 2 was also turned in the field, but was supplemented with minerals only. Groups 3 and 4 were fed corresponding rations in the dry lot. Group No. 5 was kept in the dry lot but was hand-fed enough corn, supplemented with a half pound of protein concentrate daily, to produce about the same gains as the group "hogging-off" soybeans with the protein-mineral supplement.

Two other groups of five pigs each were kept in the dry lot and individually fed on rations supplemented with protein and minerals. One of these groups received 58.5 per cent soybean and 20 per cent corn. The other received 78.5 per cent soybeans.

At an average weight of 85 pounds pigs in all groups were changed to a hardening diet, containing cottonseed meal.

Pre-Hardening Period

During the pre-hardening feeding period, both groups of pigs hogging off soybeans made more rapid gains than corresponding groups in the dry lot. The actual daily gains for these groups were 0.75 and 0.67 pound versus 0.58 and 0.52 pound. That means that the protein-supplemented groups gained 0.75 and 0.58 pound compared with 0.67 and 0.52 pound for the groups without supplement.

The group which received 58.5 per cent soybeans and 20 per cent corn made greater average daily gains than the group which received 78.5 per cent soybeans. The gains were 0.79 and 0.60 pounds per day. The gains made by all groups during the soybean feeding period were below normal. However, good gains (1.67 to 1.96 pounds per day) were obtained for all groups on the hardening diet.

Ninety-one per cent of the carcasses from pigs fed large amounts of soybeans were judged to be hard, while 93.9 per cent of the corn-fed group were rated hard.

Main conclusion of the workers was that pigs can be fed a diet of soybeans alone with mineral mixture to an average weight of 85 pounds. By changing to a hardening diet containing 13 per cent cottonseed meal at this weight the grower can be assured firm carcasses.

Pigs from Minn. 1 Males, Duroc Sows Perform Well

Pigs from sows of Duroc breeding but sired by Minnesota No. 1 boars have surpassed the performance of pigs from the other mating systems tried by H. A. Stewart in tests at the Central Farm.

The basis of comparison between lines of breeding were, (1) the feed lot rate of grain; (2) the cut-out evaluation of the carcass at approximately 215 pounds live weight; (3) reproductivity of the females as reflected by the number of pigs born alive; and (4) the number and weight of pigs alive at 56 days.

Stewart has completed comparisons for two generations between purebred Durocs; a crossbred group maintained by a systematic rotation of Duroc, Tamworth and Poland China breeding; and topcrosses resulting from the use of boars from four different inbred lines on females of Duroc and Tamworth x Duroc breeding.

Offspring of the four Minnesota No. 1 boars used in the trials, averaged 10 pounds heavier at 154 days than pigs by boars of other inbred lines. In litter weight at 56 days the Minnesota line averaged approximately 30 pounds more.

Prevent Skipper Flies From Contacting Meat

Several different types of containers for protecting hams from attack by skippers, *Piophila casei* (L.) were tested by B. B. Fulton over periods of three to four months. Skipper flies were reared and released in the storage room during the entire period. Extreme care was taken to protect the meat from flies before it was enclosed.

Use Special Cage

The most complicated protector was a cage consisting of a 30-mesh wire screen cylinder with muslin extensions above and below. Other containers consisted of single and multiple layer paper bags, or a paper bag enclosed in a cloth bag. The bags were all large enough to fit loosely around the ham and were tied tightly around a single wire supporting the ham. The only exceptions to this method of hanging were paper wrapped hams, which were hung, hock down, in cotton sacks.

All of these containers gave complete protection from skippers. Apparently any device is effective which will prevent the skipper flies from coming in contact with the meat itself or with cloth or wet paper which is touching the meat.

Hams Develop Mold

All of the protected hams developed mold on the meat side, but none of them spoiled. Little difference in the degree of moldiness could be noted between the different methods of protection. No moisture proof paper was used in any of the tests.

One ham was wrapped in paper and enclosed in a cotton sack impregnated with an insecticide, methoxychlor, which killed by contact, the flies attracted to the ham by the odor. This was hung in a separate room in which skipper flies were also released. Ninety dead flies were recovered from an open box placed under the ham. Probably many others died elsewhere after resting on the bag.

This treatment may have possibilities as a means of reducing the number of skipper flies in a building, and thus reduce the chance of infestation while meat is being handled.

Sugar Has Slight Effect On Flavor of Hams

Sugar is a generally-accepted ingredient in meat curing formulas. However, D. E. Brady, F. H. Smith, T. N. Blumer and Nelson Tucker found in a study of cured hams that varying amounts of sugar had only a slight influence on the palatability.

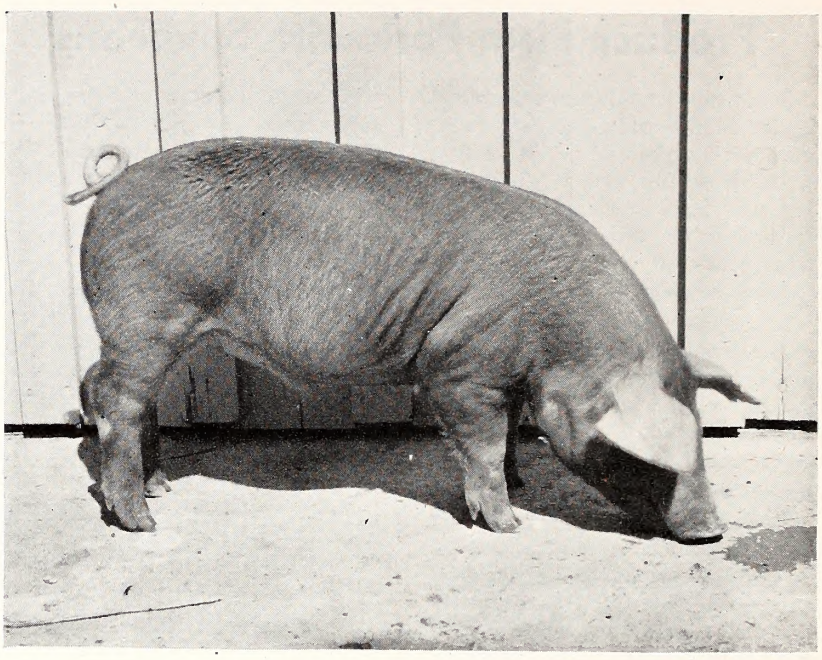
The hams were cover-cured with from 0 to 43 per cent sugar in the salt mix and aged 125 days. The highest content of sugar found to be present in the tissues at the end of curing was less than 1 per cent.

Forty hams from 20 hogs were used in these experiments. The hams were divided into eight lots of five hams each. Eight cures were prepared (one for each lot) consisting of 0, 6, 11, 20, 27, 33, 38, and 43 per cent sugar. The hams were cured 2½ days per pound and were overhauled on the fourth and eleventh days. Following completion of the curing process, the hams were soaked three hours in tap water (55° F.), scrubbed in 120° F. water, hung up and dried for two hours at 130° F. and then smoked at 130° F.

Following smoking, the hams were stored at an average mean temperature of 69° F. An average relative humidity of about 53 per cent was maintained to control the mold growth.

Moisture, fat, salt and glucose determinations were made 24 hours after the completion of smoking, after 26 days of storage and after 125 days of storage. A sharp decrease in the glucose content was noted during the storage period, bringing the level for all cures down to that which approximates the level where no sugar was added. All glucose values noted, with one exception, were less than one-half of one per cent.

Results of this experiment support the view that sugar is not an essential ingredient in the production of an aged, country style cured ham. It should be pointed out, however, that the data provide no evidence that reasonable amounts of sugar are in any way injurious to the quality of the cured meat.



A weight of 60 pounds at 56 days is the record of this pig. He is one of a test group used to determine the nutritional requirements of suckling pigs. The pigs were fed an artificial diet made of dried skim milk, corn sugar and minerals.

Baby Pigs Thrive on Artificial Diet

Baby pigs, taken from their dams at three days of age and fed a specially-mixed ration including milk, had gained an average of a pound per day by the time they were 56 days of age. The experiment was conducted by H. A. Stewart and J. A. Weybrew as a part of a continuing study to determine the nutritional requirements of suckling pigs.

Reared In Cages

In this trial pigs were placed in screen-floored cages at three days of age. Three essentially whole milk diets were compared. Diet A consisted of evaporated canned milk; Diet B, reconstituted skim milk solids plus butter; and Diet C, reconstituted whole milk powder.

At the end of the eight-week feeding period, the pigs weighed an average of 55.7 pounds. During the last week of the test, they gained an average of 1.8 pounds per pig per day.

Milk Solids Diet

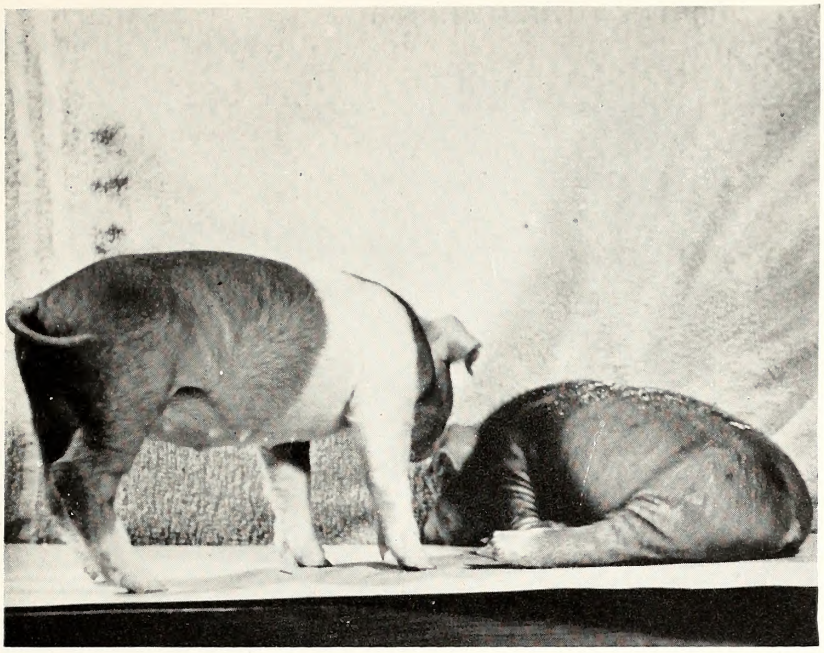
For the first four weeks, the pigs were reared in cages on fortified milk diets. Then they were moved to concrete floored pens and given, in addition to the milk, free access to a mixed ration of natural feed ingredients supplemented with dried skim milk fat (purified cottonseed oil), corn sugar and minerals. The milk solids in the fluids feed was replaced gradually by this mixed ration.

By the seventh week, the pigs were receiving only this mixed ration, either dry from a self-feeder or as a gruel. No advantage was demonstratable during this period from further supplementing this mixed ration with 5 per cent dried distillers solubles.

Exceed Average of Farm-Raised Pigs

At normal weaning age, all hand-fed pigs weighed more on the average than a comparable number of similar pigs that had been suckled by their dams on good pasture with access to a creep-feeder.

Since the performance of the pigs in this study exceeded the average of farm-raised pigs by 20 to 30 pounds, Stewart and Weybrew consider the problem worthy of continued study.



A diet of skim milk supplement ond 5 per cent purified cottonseed oil did not prove to be odequote for these test pigs. In the first week of the experiment they developed o porolysis. Other pigs receiving more fot remoined normol.

Soil Fertility Reflected in Lamb Gains

Only after three years of using the same fertilizer treatment on field plots were nutritionists able to demonstrate a difference in chemical composition and nutritive value of soybean forages taken from the plots. Phosphorus was the fertilizer element under observation. The tests were conducted on a Bladen type soil extremely low in phosphorus.

During the first two years of work the investigators obtained no clearcut evidence that phosphate fertilization influenced either the chemical composition or nutritive value. The measurement for nutritive value was made through lamb feeding trials, digestion trials and determination of nitrogen balance.

Differences Show In Third Year

However, in the third year, the phosphate-fertilized plots produced soybean hay containing more protein, more phosphorus and more calcium than did hay taken from non-phosphated plots. In these third-year trials, the hays were compared in feeding tests with rabbits as well as lambs.

In rations where the hays were supplemented with sugar and fat, animals of both species made significantly greater gains in favor of the phosphate fertilization. When the hays were supplemented with difierentially phosphate - fertilized corn, only the rabbits responded in favor of the phosphate fertilization.

Study Weights, Blood Serum

A study of the phosphorus content of the diets, the weight gains and the blood serum phosphorus levels of the experimental animals indicates strongly that the difference in phosphorus content of the hays accounted for part of the response.

To gather additional data on this factor the lambs on the sugar-hay ration were continued in further tests at the end of the initial feeding period. Half of the lambs on the phosphate-fertilized hays and half on the non-phosphate-fertilized hays received a dicalcium phosphate mineral supplement. In this experiment, the lambs on the non-phosphate-fertilized hay made gains equal to those on the fertilized hay.

Cooperating in these studies are G. Matrone, J. A. Weybrew, F. H. Smith, E. U. Dillard and W. J. Peterson.

Test Pigs Develop Paralysis

Baby pigs, weaned at two days of age, and fed a milk diet prepared from skim milk powder supplemented with 5 per cent purified cottonseed oil developed, during the first week of the experiment, a paralysis of the hind quarters as shown in the accompanying photo.

These pigs were otherwise normal and made good growth. Litter mates on a milk diet supplemented with the same fat but at a higher level (20 per cent of the solids) remained normal. This condition did not appear in the pigs fed milk diet supplemented with butter or partially hydrogenated cottonseed oil at either the high or low levels. All diets were uniformly supplemented with mineral and cod liver oil.

Further experiments on the etiology of this condition are contemplated by H. A. Stewart and J. A. Weybrew.

Cattle Indicate Preference For Woodland Forage Species

Cattle have marked preferences for various types of forage. This is very apparent when farm cattle accustomed to improved pasture are turned into the woods.

In studies carried out with yearling steers in Piedmont forest types, C. M. Kaufman found that grasses and herbs were sought out first. Honeysuckle was only slightly used for as much as a week until the animals had developed a taste for it. After this, however, they obtained much of their daily diet from honeysuckle if the supply was ample.

The foliage of some hardwood tree species was very palatable during the spring while the new growth was tender, but large amounts of tree foliage were not used until the cattle were forced by a shortage of more preferred forage to turn to tree browse. Some vines, trumpet creeper and smilax particularly, were readily browsed. In Piedmont forests these vines are not common enough to materially affect the forage supply.

Cattle ate much less than normally during the opening days of the woods grazing period. They had to become adapted to the change.

Protein in Mashes Related to Growth

What effect does the protein content of mashes and feeding grains have upon weight gains, mortality and feeding efficiency of turkeys?

To answer this question, J. W. Kelly, R. S. Dearstyne and H. L. Lucas tested six different feeding treatments, using two pens of Bronze poults each on each treatment. The control treatment was 24 per cent mash with whole corn and oats feeding started at eight weeks of age. The other five treatments involved five mashes with protein contents of 20, 24, 28, 32, and 36 per cent, respectively. These were fed with cracked corn starting the first day and oats started at four weeks of age.

Weights Taken Every 14 days

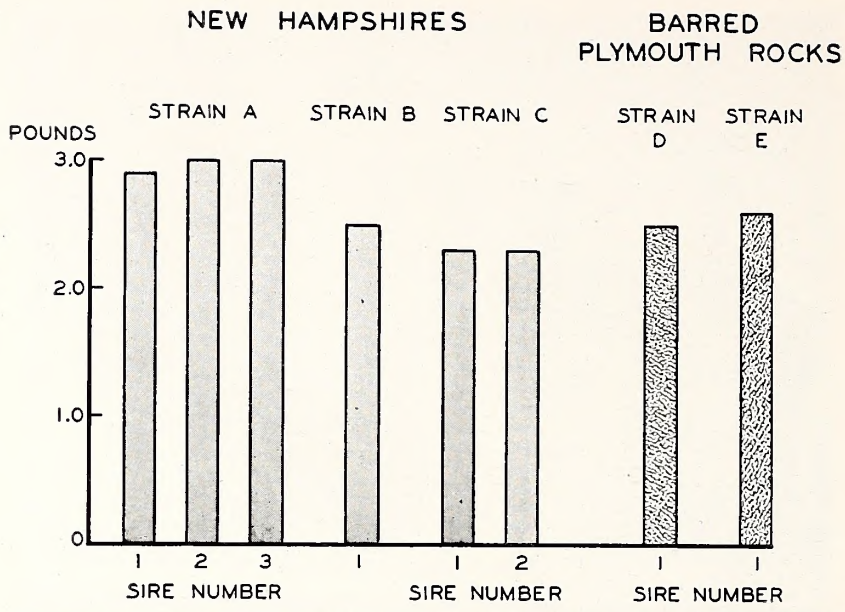
Body weights were taken at 14-day intervals up to 12 weeks and 28-day intervals thereafter up to 28 weeks. The mean weights for males at 12 weeks were: control, 4.75 pounds; and for the other treatments in ascending order of protein content of mash, 3.13, 4.32, 5.01, 5.17 and 4.75 pounds. For the females: control, 3.99 and for the other treatments, 2.61, 3.74, 3.55, 4.06 and 4.16 pounds.

A preliminary statistical analysis showed that as the protein content of the mash increased, the 12-weeks weights increased significantly. After the feed consumed by turkeys that died before 12 weeks of age was deducted, the treatment differences in feed required to produce a pound of turkey were small, varying from 3.13 to 3.38. There were losses from intestinal coccidiosis in all lots, but they were considerably higher among birds on the 20 per cent mash than on the others.

Older Birds Do Not Benefit

In contrast, the protein content of the mashes appeared to have no significant effect on the mean weights of the birds at 28 weeks of age. The average weights of males receiving the six diets ranged from 19.7 pounds for the 36 per cent mash to 21.4 pounds for the control 24 per cent mash.

There was more variation between the mean weights of females on the different diets, but the differences were still not significant.



Sires make a difference, but, as these charts show, strains within a breed can mean a greater difference. Each strain represented is being inbred for a hybrid cross.

MOUNTAIN STATION INBREEDS BROILERS

Inbred lines of New Hampshires and Barred Plymouth Rocks are being selected for broiler qualities at the Mountain Branch Station near Waynesville, E. W. Glazener, R. S. Dearstyne and W. L. Blow report that the 1948 birds showed improvement over 1945 birds in growth rate, broodiness, pauses and mortality. But there were serious declines in fertility and hatchability. Following is a comparison of records for the two years:

		Av. 6 Mo. Egg Prod.		Av. 12 Wk. Body Weight		Hatchability	
Breed	Strain	1945	1948	1945	1948	1945	1948
NH	A	80	100	2.7	3.0	75	53
NH	B	97	95	2.0	2.5	75	63
NH	C	100	101	2.1	2.3	44	62
BPR	D	98	90	2.3	2.6	59	39
BPR	E	71	90	2.4	2.5	64	52

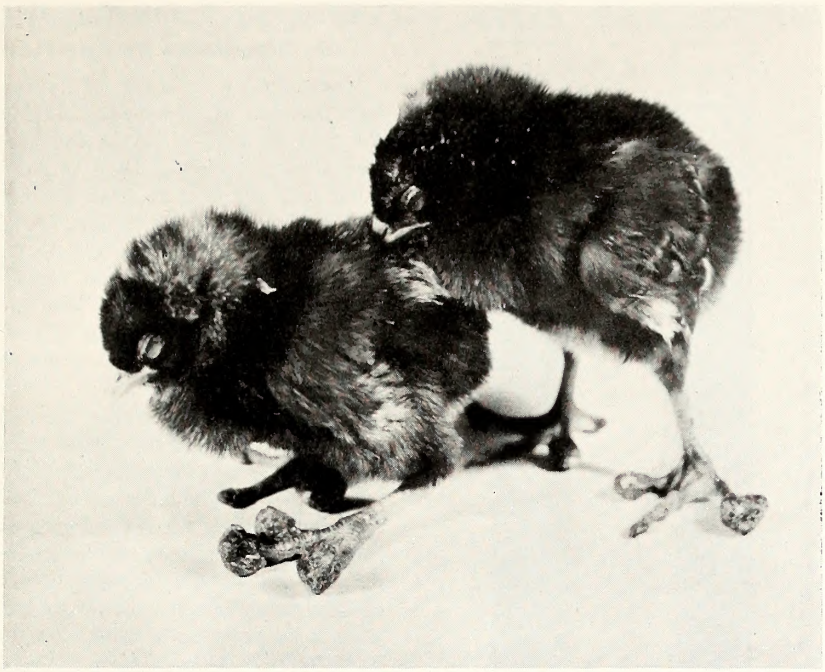
Improvement in growth rate did not affect egg production unfavorably. In fact, egg production improved in the two lowest strains, Strain A and E. Egg size is above standard in all strains. But fertility dropped from better than 90 per cent to around 60 per cent. Although hatchability tended to decline within the strains, it is still good in some families.

CENTRAL BREEDS FOR LIVEABILITY IN CHICKS

Increasing the liveability of newly-hatched chicks is receiving primary emphasis in the White Leghorn inbreeding program being conducted at the Central Station by E. W. Glazener, R. S. Dearstyne, W. L. Blow and C. H. Bostian. Ultimate objective of the project is to compare purebred, crossbred and hybrid birds for egg production. Besides Leghorns, Rhode Island Reds and Barred Plymouth Rocks are being used in inbreeding work.

During 1948 the Rhode Island Reds averaged 128 eggs per bird, the Barred Plymouth Rocks 122, and the White Leghorns 102 for the first six months of production. The five-year averages for the same period are 129, 125, and 117 eggs per bird, respectively.

Although the White Leghorns appeared to drop somewhat in egg production, the reduction does not seem to be the result of inbreeding.



This is one symptom of the unsanitory conditions generally associated with a septicemic disease which occurs in many North Carolina flocks each spring.

TURKEY LOSSES DROP TO NEW LOW

Mortality in the Station turkey flock during 1948 was only 9 per cent, the lowest on record, according to B. F. Cox, F. W. Cook and F. R. Craig. These particular records cover only the first six months of life.

During the last nine years, average mortality during the first six months was over 21 per cent of the 5,664 poults started. Coccidiosis in two years and a heavy chronic blackhead mortality were largely responsible for the high losses.

Records of hen losses during 90 days of lay were also below average in 1948. The 1948 loss was 3.28 per cent as compared with a ten-year average of 6.13 per cent.

A study by H. L. Lucas of losses from blackhead in the last eight years showed that maximum losses occurred when the birds were 100 days of age. At 100 days 37.3 per cent of the birds will have died; at 150 days, 85.1 per cent; at 200 days, 97.7 per cent; and at 250 days, 99.7 per cent.

Lucas points out that these percentage figures represent what will happen in the long run and not necessarily what will happen in any given year.

FOWL TYPHOID GERMS USED TO TEST SULFAS

Twelve different strains of the germ causing fowl typhoid were isolated by B. F. Cox, F. W. Cook and F. R. Craig and were used to inoculate pullets in a study of the relative virulence of the organisms. The study was preliminary to testing various sulfonamide treatments for the control of the disease.

The strain selected for use was a North Carolina strain which had been recovered from a poultry flock suffering from an outbreak of fowl typhoid. Organisms of this strain were then repeatedly inoculated into young pullets to permit a detailed study of the course of the disease and time of death.

The investigators say this information will be very important in studying the relative effectiveness of the various sulfa drugs. They plan to study the reaction of the organisms in the body tissues to drug treatment.

Poor Sanitation Thought to Cause Septicemic Disease

Improper brooding and lack of sanitation are the probable causes of a septicemic disease of young chicks occurring in North Carolina flocks during the spring months, report B. F. Cox, F. W. Cook, and F. R. Craig. The report is based on a study of 19 specimens consigned to the poultry disease diagnostic laboratory.

Isolate Streptococcus

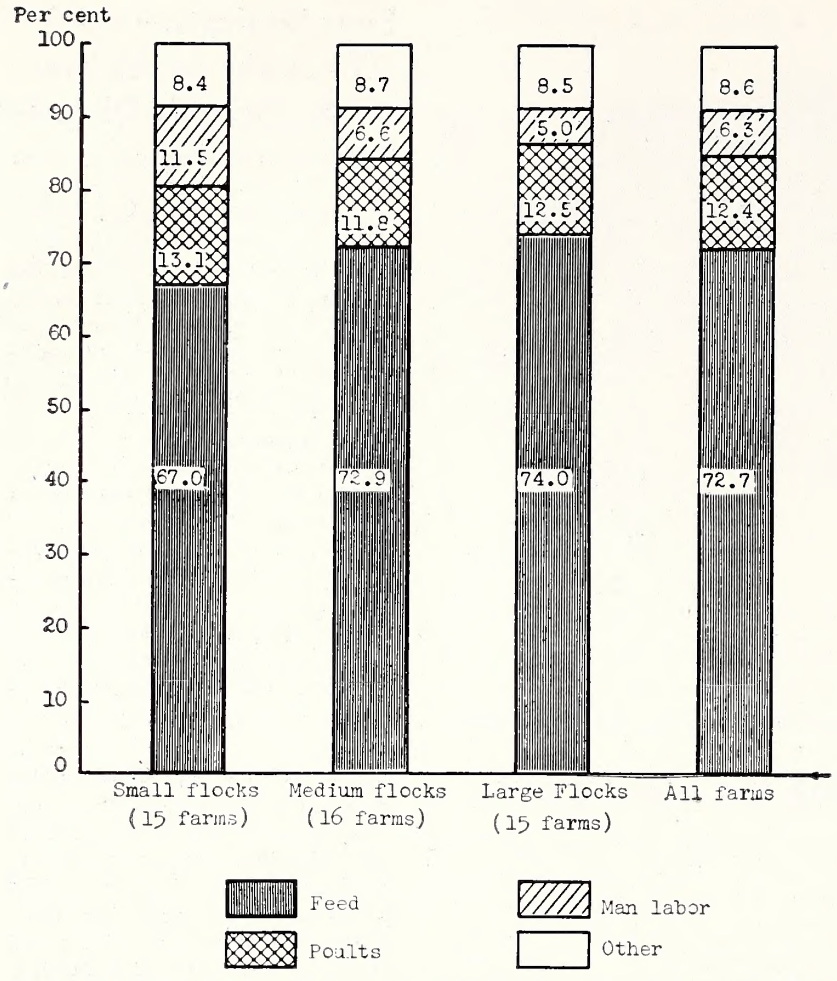
In all 19 cases, the investigators were able to isolate a streptococcus organism from the internal organs. The organism showed the morphological and biochemical characteristics of *Streptococcus zymogenes*. The symptoms, age and postmortem findings of the infected chicks resembled those resulting from natural outbreaks of pullorum.

To determine how the disease is transmitted, Cox and his associates prepared suspensions of the streptococcus organisms in physiological salt solutions. These were fed to groups of newly hatched chicks 24 hours before receiving feed; at the time of receiving feed; and 24 hours after the first feeding. The chicks were reared under optimum conditions, and were sacrificed for postmortem examinations at two months of age. In one case lesions were observed in the liver, but in no case was the streptococcus organism recovered.

Tests on Two-Week-Old Chicks

Another group of chicks two weeks old were inoculated by various routes with cultures of the organism. Injections were made by mouth, into the rectum, into the body cavity, into the muscles and under the skin. Six weeks after inoculations, all birds were sacrificed for postmortem examinations. No lesions were observed, and in no case was the streptococcus organism recovered.

The investigators believe it probable that natural infection may be transmitted by means of the respiratory tract. The respiratory method of transmission was not attempted in these studies.



Feed accounted for almost three-fourths of the total cost per turkey raised. The cost of man labor comprised a much higher proportion of total cost in small flocks.

Trapnesting, Family Testing Cuts Broodiness by One-Half

The number of days of laying lost because of broodiness during the first 90 days of lay in the Station turkey flock has been reduced from 14.5 per cent in 1942 to only 5.46 per cent in 1948, report C. H. Bostian, R. S. Dearstyne and E. W. Glazener. Trapnesting and family testing to select breeders are the surest means of reducing broodiness and other long pauses which limit egg production.

Over the same six-year period, days lost in long pauses other than broodiness were reduced from eight per cent in the peak year of 1946 to three per cent in 1948. The percentage of individuals showing neither pauses nor broodiness increased from 25 per cent in the low year to 66 per cent in 1948.

While few turkey producers are in a position to do trapnesting, they can insist on buying breeding males and basic stock from sources where such work is done.

An analysis of hatchability records for five years at the Station farm by H. L. Lucas revealed that maximum hatchability occurred on April 4. Lucas found that in only one year out of five could maximum hatchability be expected to fall either before March 10 or after April 29. The study covered 53 hatches, including 30,363 eggs.

Study Proves Turkeys Profitable

Why has the value of turkeys sold from North Carolina farms increased two million dollars during the past eight years? A study by W. H. Pierce of records from 46 farms in Union and Anson Counties reveals the answer, namely that raising turkeys is a profitable enterprise when efficiently conducted.

The following points regarding production requirements, costs, and returns in raising turkeys were brought out by the study conducted in 1946 and 1947:

Feed, the largest individual item of cost, averaged $4.80 per bird raised. The average feed consumption per bird was 46 pounds of grains and 66 pounds of mash, or 5.8 pounds of feed per pound of live turkey produced. The cost of poults averaged 64 cents, but with a mortality rate of 21.5 per cent the average cost was 82 cents per turkey raised.

Based on an average growing period of 30 weeks and a mortality rate of 20 per cent, labor requirements amounted to 100 man hours per 100 birds raised. Buildings and equipment used for turkeys were valued at $400 per farm studied, or 56 cents per bird raised in 1946.

The gross cost was $6.62 per bird, or 34 cents per pound of turkey produced. The average price received was 36.4 cents per pound. Net returns above all costs was 44 cents per bird. Returns to man labor spent on turkeys averaged 72 cents per hour.

Pierce's study showed that turkeys may be adapted to many farming situations. Among the reasons for the increase in popularity of turkey production as a farm enterprise are: (1) Turkeys enable the volume of business to be increased on farms where available cropland does not permit an increase in the acreage of cash crops. (2) Raising turkeys helps to utilize family labor effectively without interfering seriously with other farm enterprises. (3) When efficiently managed, turkeys provide an effective means for marketing surplus feed grains.

Three-fourths of the Anson and Union farmers had reduced acreage or eliminated cotton completely since the addition of turkeys and had increased the acreage of small grains.

PRE-INOCULATION AIDS BREEDING

Methods of inoculating tomato seedlings in the greenhouse before transplanting to the field are expected to speed up the breeding of a tomato variety resistant to southern bacterial wilt, according to D. E. Ellis, Arthur Kelman, and Fred D. Cochran.

Inbred lines and crosses selected for resistance in 1947 were planted in flats in the greenhouse. The plants were thinned, the roots wounded, and inoculated with bacteria when they were about three to four inches tall. Plants that survived this inoculation were dipped in a suspension of bacteria and transplanted to pots and the survivors transplanted to the field. Plantings were made at the Oxford Tobacco Station, Oxford, N. C., and were inoculated a third time in the field.

Several numbered lines possess a moderate degree of resistance, Two of the most resistant were 31-3-16 and 45-2-8. At the end of the growing season, 61 and 42 per cent, respectively, of these two lines had survived these rather severe inoculation tests, whereas, Pan America and Marglobe were killed 100 per cent. Selections were made from these two and a number of other promising lines for more extensive tests in 1949. An effort will be made to improve size and quality as well as wilt-resistance.

Late blight studies have been continued in the mountain sections, at Laurel Springs, Hendersonville, and Waynesville where the disease is usually severe. A moderate degree of resistance has been found in two small fruited types, one designated as Cherry and the other T-436. Crosses have been made between these two types and four commercial varieties — Rutgers, Marglobe, Pan America, and Louisiana Pink.

First generation crosses were vigorous and moderately resistant.

Tribasic Copper Sulfate Controls Late Blight

Late blight, a fungus disease which has greatly reduced tomato production in the mountain area in recent years, can be effectively controlled, according to D. E. Ellis and R. P. Scheffer.

Results of a test in 1948 at the fruit and vegetable laboratory near Hendersonville showed sizeable profits resulting from spraying or dusting tomatoes. The test also indicated that fungicides containing "fixed" copper compounds were superior to certain new organic fungicides for controlling late blight.

Tribasic copper sulfate spray or dust gave better disease control and higher yields than Parzate spray, Parzate dust, or an alternating schedule of Zerlate-tribasic dust. In comparison to the untreated check, all treatments resulted in marked increases in yield. If tomatoes sold for $3 a bushel, increased returns from dusting or spraying amounted to from $300 to more than $900 per acre, depending upon the fungicide used.

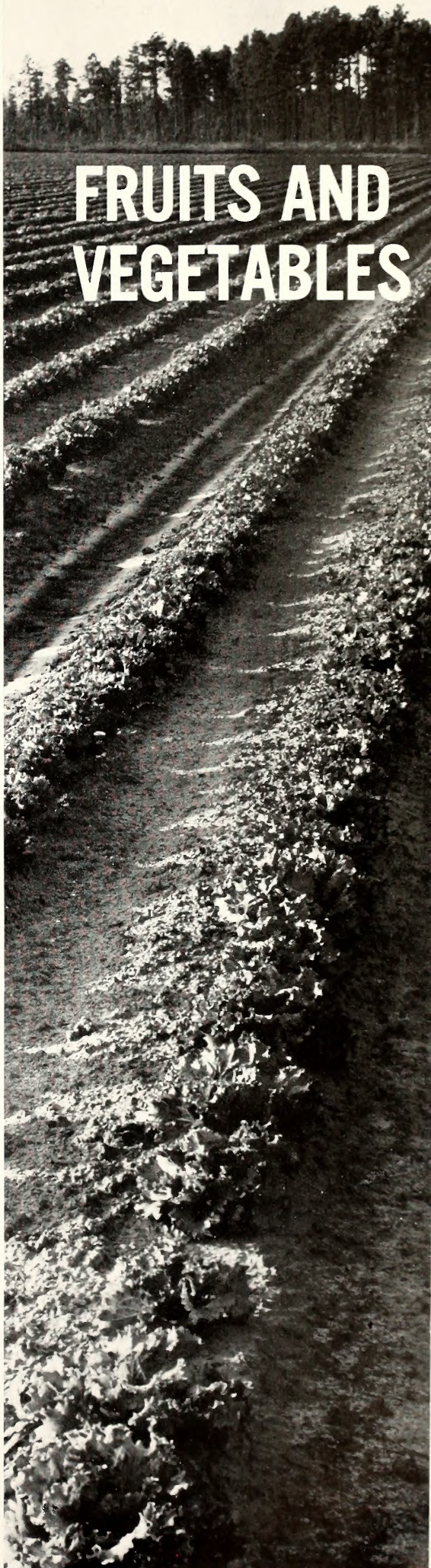
On the basis of these and tests in other states, it is recommended that fixed copper sprays or dusts be used to control tomato late blight in North Carolina.

Tribasic Controls Leaf-Mold

Leaf-mold (caused by *Cladosporium fulvum*), a serious greenhouse disease of tomato that sometimes causes losses in field plantings, was controlled by application of fungicides in tests at Hendersonville during 1948.

D. E. Ellis and R. P. Scheffer report that early in the season, some of the fungicides applied to control late blight were also effective in reducing the severity of leaf mold.

Disease severity readings indicated that tribasic copper sulfate spray (4-100) afforded the best control. Plots sprayed with this material had a leaf-mold severity rating of only 19 in contrast to 65 for unsprayed check plots. Leaf-mold ratings for other materials included in the test were as follows: tribasic dust, 26; Zerlate tribasic dust, 32; Parzate spray, 32; and Parzate dust, 45.



"Yams," Collards Tops for Vitamins

Sweet potatoes and collards, two of the South's most widely grown vegetables, are excellent sources of both carotene (pro vitamin A) and vitamin C, according to W. J. Peterson, F. D. Cochran, Harriet Pressly and F. W. Sherwood.

In recent tests for vitamin content, Peterson and his associates found that an average serving of sweet potatoes (145 gms.) contains approximately 60 per cent of the recommended daily allowance of vitamin C. The vitamin A content of an average serving of sweet potatoes was found to exceed the recommended daily allowance for this vitamin.

Small Losses During Storage

Previous experiments have shown comparatively small losses in these nutrients during curing and storage. The sweet potato is unique in its ability to retain practically all of its vitamin C during baking.

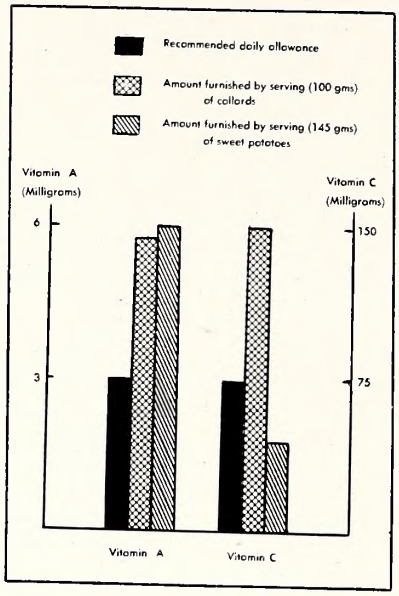
Three different varieties of sweet potatoes were studied: Louisiana Porto Rico, Georgia Bunch Porto Rico and Australian Canner. The average vitamin C content in milligrams per 100 grams was: Louisiana Porto Rico, 29; Georgia Bunch Porto Rico, 28; and Australian Canner, 28. Vitamin A values in milligrams per 100 grams were: Louisiana Porto Rico, 3.3; Georgia Bunch Porto Rico, 3.2; and Australian Canner, 6.4.

Grown at Three Locations

These varieties were grown at each of three different locations in the State — Wilmington, Wallace and McCullers. There was no appreciable difference in the nutrient content by location.

In the tests with collards, two varieties — Georgia and Louisiana Sweet—were grown at three levels of nitrogen fertilization and then studied for nutrient content. The results strongly suggest that collards grown on nitrogen-poor soil are slightly inferior in vitamin and mineral content.

On a fresh weight basis, 100 grams of collards contained on an average 150 milligrams of vitamin C (more than twice the recommended daily allowance); 5.7 mg. (approximately twice the recommended daily allowance) of carotene (pro-vitamin A); 0.2 mg. of vitamin B_1; 0.4 mg. of riboflavin; 0.3 gm. of calcium; and 1.6 mg. of iron.



"Yams" and collards furnish all the vitamin A we need and most of the C.

Prolonged cooking of vegetables in large quantities of water has been proven detrimental to vitamin C. In these tests, the best cooking method for vitamin C retention was cooking in a pressure sauce pan.

Since both sweet potatoes and collards are such excellent sources of carotene and vitamin C and since they are available over such long periods of time, it is small wonder that they have been called "life savers in the South."

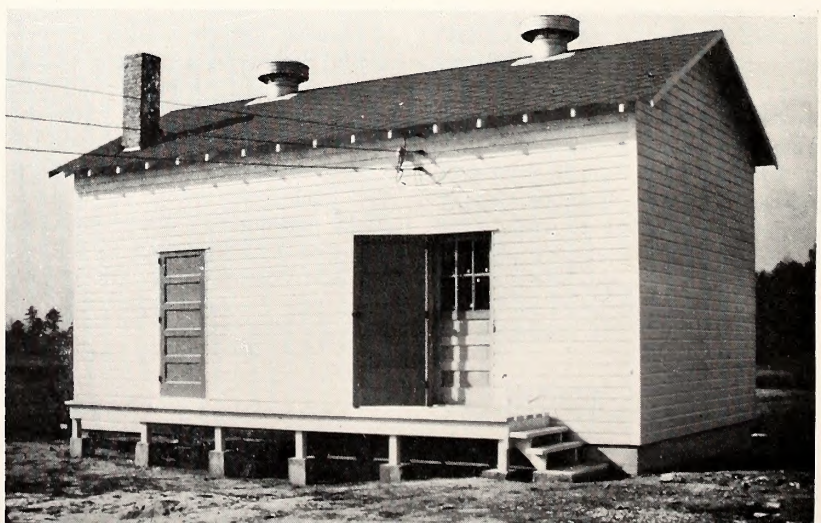
Very Little Ventilation Needed With Electrical Heat Curing

Three year's study of a sweet potato curing house by J. W. Weaver, Jr. and S. H. Usry shows that very little ventilation is ever needed where electric heat is used. While the house has been filled to capacity only one of the three years, all of the ventilators have been kept closed at all times during the curing and storage of potatoes. The quality of the potatoes has been excellent at the end of each storage period.

Electricity needed for heating the 1000 bushel house has ranged betwen 3.5 and 5.5 kilowatt hours for each bushel of potatoes cured and stored each year. The storage period has averaged 21 weeks each year during the three years. At least six electric heaters (750 watts each) should be installed in a well-built house of 1000 bushel capacity. Electricity cost per bushel would be less in a larger house and more in a smaller house.

A dirt floor with continuous foundation wall is more desirable in a storage house than sills, joists and double wood floor set up on piers. The cost of construction will be lower for the house with dirt floor, and the storage volume of the house will be increased from 5 to 10 per cent. Better curing and storage conditions are provided in the house with dirt floor because the air around the potatoes averages about 10 per cent higher in relative humidity than the air in a house with wood floor on piers.

This 1,000-bushel sweet potato storage house at the McCullers Branch Station was found to use from 3.5 to 5.5 kwh of electricity per bushel for curing and storing.



Some Plants Damaged By Soil Treatments

Previous work has shown that different crop plants do not respond equally well to soil treatment for root knot control. Some plants such as snap bean may be injured if certain soil treatment materials are applied at high dosages or if planting is made too soon after treatment.

In a 1948 McCullers experiment, D. E. Ellis and C. N. Clayton applied D-D, ethylene dibromide and chloropicrin at rates of 200, 400, and 600 pounds per acre both in the fall and spring. Snap beans were planted 30 days after the spring treatment and records obtained on root knot, yield and growth.

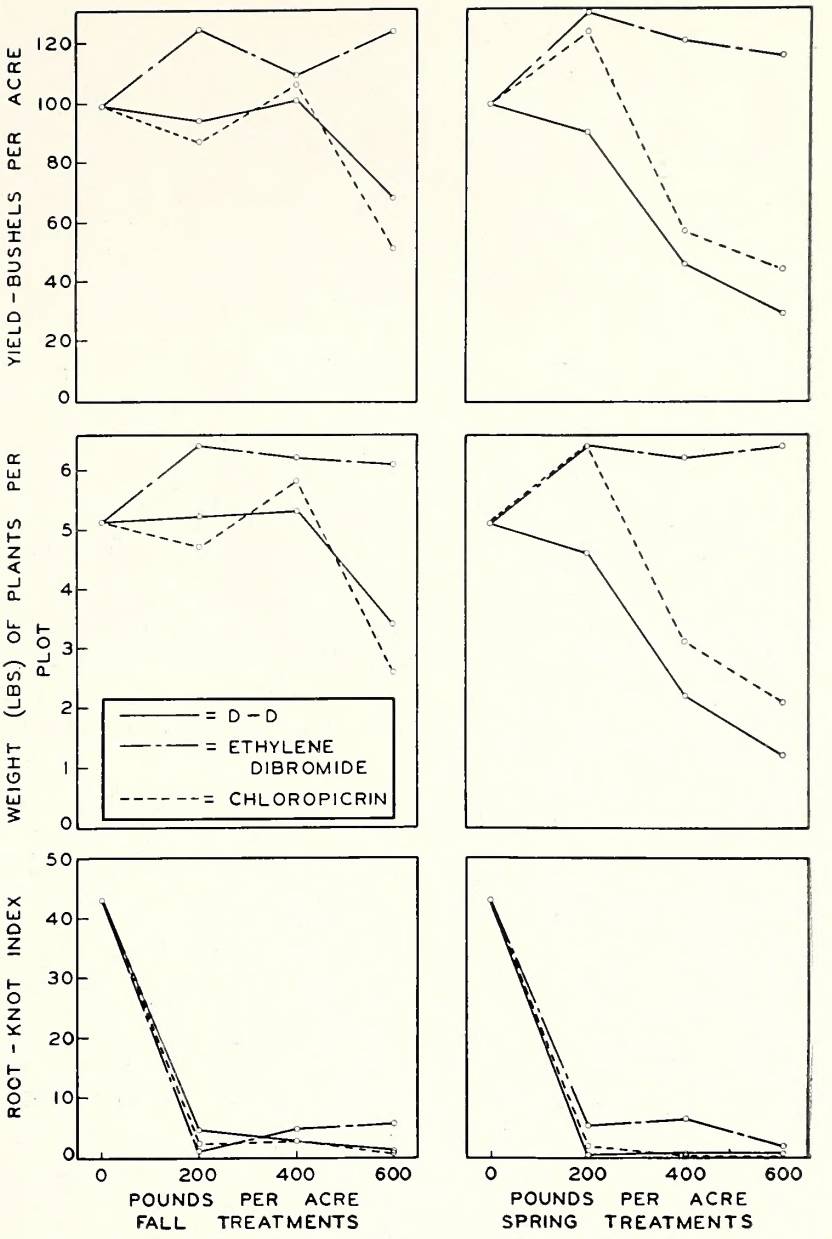
All materials at all three rates, applied either in the spring or fall, gave satisfactory control of the root knot nematode. However, injury, in the form of reduced yields and growth of beans resulted from D-D and chloropicrin applied at the highest rate in the fall and at the two higher rates in the spring. Ethylene dibromide apparently caused no injury.

From these results, Ellis and Clayton conclude that fall treatment with certain of the soil-treatment chemicals is generally safer than spring treatment and that high rates of application should be avoided.

Internal Cork Gets Worse

Internal cork of sweet potato appears to be increasing in the southern Piedmont and Coastal Plain counties, according to a survey made by L. W. Nielsen. The 1948 survey included many of the farms from which root samples were collected in 1947. Root samples were taken from only those farms that maintained the same stock of roots as sampled previously.

By comparing the relative amount of internal cork in the root samples for the two years, it was evident that the disease was spreading in some sections of the State. There was no evidence of spread or increase in the northern Piedmont or Coastal Plain counties. However, there was an increase in the tier of Piedmont counties bordering South Carolina, and the southern Coastal Plain counties.



Not all plants react favorably to soil treatments for root-knot. Snap beans in these experiments were injured by heavy applications of D-D and chloropicrin.

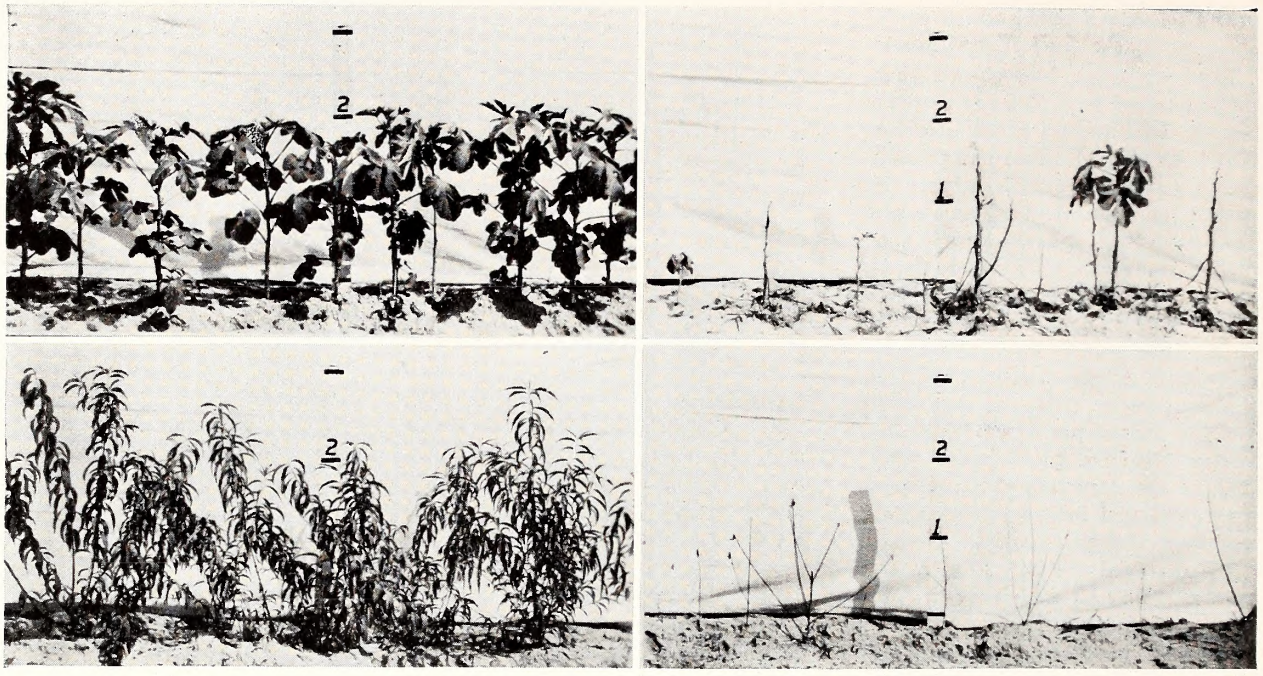
Winter Work Speeds Sweet Potato Breeding

Special methods of growing and handling sweet potato plants in the greenhouse during the winter have speeded up the production of flowers for breeding work, according to D. T. Pope.

A total of 43 seedlings and varieties bloomed and set seed in the greenhouse at Raleigh during 1948. This was accomplished by grafting, girdling, and training the plants to grow on a trellis. Pope had little success in obtaining flowers from varieties of the Jersey group.

The percentage seed set increased progressively from 5 per cent in December to 61 per cent in March. This was due in part to raising the relative humidity after pollination and the utilization of more fertile parents. Other enviromental conditions are doubtlessly involved.

Treating the seed with sulphuric acid just before planting resulted in 67 per cent germination. The seedlings were spaced two feet apart in rows three feet apart.



These okro (upper left) and peoch plonts (lower left) were plonted on plots treoted with one-fourth pound of Uromon. Plonts on the right were on untreoted plots.

Seek to Correct Ill Effects of Uramon

The addition of cottonseed meal and peanut-hull as supplementary treatments alleviates some of the yield-depressing effect of Uramon when that material is applied as a control measure for root knot nematode on certain vegetables.

D. E. Ellis and C. N. Clayton made this finding in tests with okra, tomato and growth of peach seedlings during 1948 at the McCullers Station. In similar tests, bean yields were neither reduced nor markedly increased on plots treated with Uramon (¼ or ½ pound per square yard) in October, 1947.

In comparison with Uramon alone, a supplementary winter cover crop of rye resulted in better yields. Peanut-hull meal and manure were somewhat less effective than rye in alleviating the deleterious effect of the Uramon.

Ellis and Clayton believe that the Uramon treatment shows considerable promise for sandy loam soils, heavily infested with root knot nematodes. The material can be applied broadcast and disked or spaded into the soil. While it is more expensive than certain of the volatile fumigants, it has the advantage that it can be applied without special equipment.

Insecticides Fail on Root Knot

In the search for materials effective against root knot nematodes, it has been suggested that some of the newer insecticides might hold promise. Results of a 1948 McCullers test conducted by C. N. Clayton and D. E. Ellis indicate that several such insecticides are not effective against this soil-borne pest.

Several chemicals with high insecticidal properties were tested at various dosages to determine their value. The materials were applied in water to root knot nematode infested soil in small field plots at McCullers Station on April 30. Okra and snap bean seeds were planted on the plots one week after treatment. Stand counts, yields and root knot severity ratings were made.

Under the conditions of this test, benzene hexachloride, DDT, parathion, chlordan, and chlorinated camphene failed to reduce appreciably the amount of root knot.

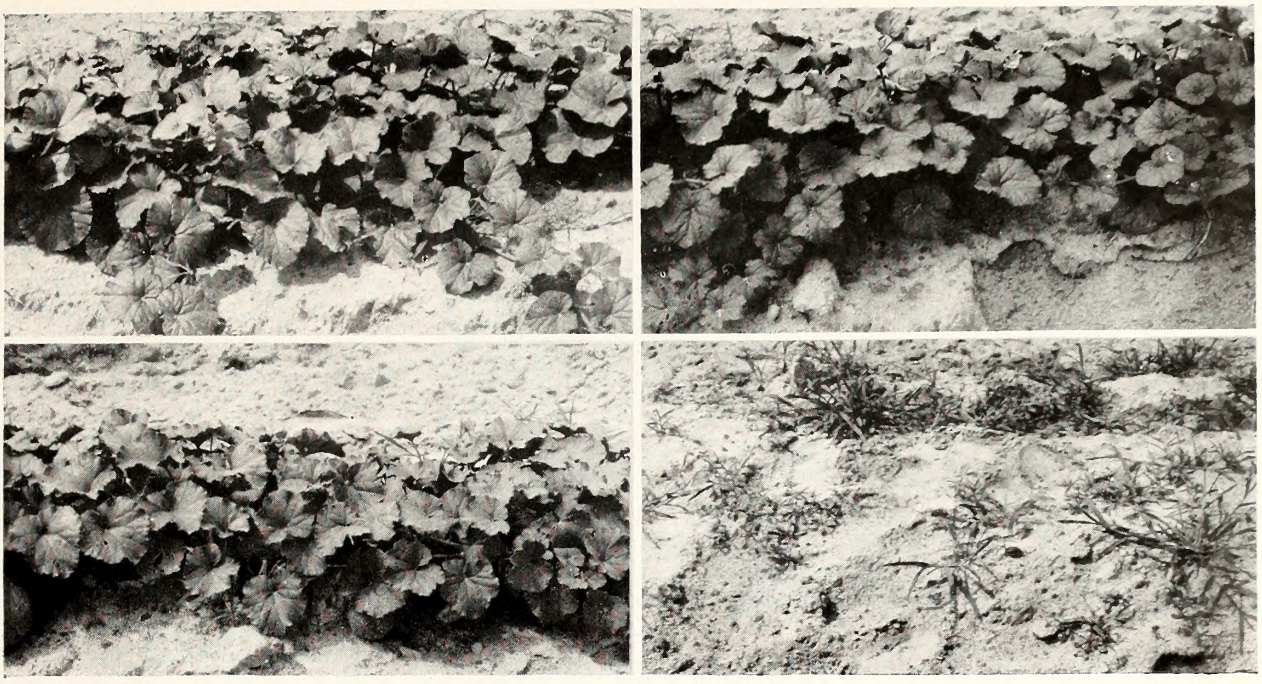
Soil Treatment Reduces Root Knot on Cantaloupes

Application of a soil fumigant in the row before planting may prove a practical method of reducing root knot damage to cantaloupe.

In an experiment at the McCullers Branch Station in 1948, D. E. Ellis applied ethylene dibromide (Dowfume W-40) after the rows were laid off and the fertilizer had been distributed. The fumigant was applied with a hand applicator at 12-inch intervals along the row and at a rate of about 55 pounds per acre.

Although the soil was only lightly to moderately infested with root knot nematodes the treatment enabled the plants to get off to a better start than where the soil was not treated. Moreover, the treated plots yielded an average of 503 crates per acre of high quality cantaloupes, while the untreated check plots yielded only 412 crates per acre. At the end of the season the roots were examined and rated for root knot severity. The treated plots had a root knot index of only two, while for the check plots, the index was 29.

Row or spot treatment with soil fumigants for widely spaced crops such as cantaloupe and watermelon has the obvious advantage of being relatively inexpensive.



These cantaloupe plants received the following treatments for root knot: upper left, charapicrin, 400 pounds per acre; upper right, D-D, 400 pounds per acre; lower left, Uramon, 2,420 pounds; and lower right, untreated.

Soil Treatment Lasts More Than One Season

The beneficial effects of soil treatment for the control of root knot may last more than one season, according to the results of experiments conducted by C. N. Clayton and D. E. Ellis.

Cantaloupes planted in 1948 on plots treated with Uramon (½ or 1 pound per square yard), or D-D (200, 400, or 600 pounds per acre), in 1946 and planted to snap bean and tomato in 1947, made much better growth and produced higher yields than on untreated plots. This was true despite the fact that the soil was very heavily infested with root knot nematodes before treatment in 1946. Yields were higher from plots which had been treated in October, 1946, 14 months before planting, than from those treated in July or March, 1946, 20 or 28 months before planting.

The higher rates of treatment with Uramon, or D-D resulted in better yields than the lower rates. The use of a water-seal with D-D enhanced control. The results suggest that under certain conditions practical control may be obtained by treating the soil every second or third year.

POTATOES RESPOND TO HIGH RATES OF PHOSPHORUS

Irish potatoes respond to relatively high amounts of fertilizer phosphorus even on soils containing as much as 900 pounds per acre of available phosphorus. The use of radioactive phosphorus as a tracer in the fertilizer enabled W. L. Nelson, N. S. Hall, and C. D. Welch to make this finding.

The investigators found that potatoes depend very heavily on the fertilizer phosphorus throughout the entire growing period. At harvest, as much as 60 per cent of the total phosphorus in the Irish potato crop may be from the fertilizer.

In contrast to potatoes, soybeans depend less and less on the fertilizer phosphorus as the root system extends. At harvest, only about 10 per cent of the total phosphorus in soybeans may be derived from the fertilizer. The remainder comes from the soil.

Potatoes have a very limited root system, and hence, depend very heavily on the fertilizer phosphorus and not so much on the soil phosphorus. This aids in explaining the responses to phosphorus on soils containing relatively high amounts of available phosphorus.

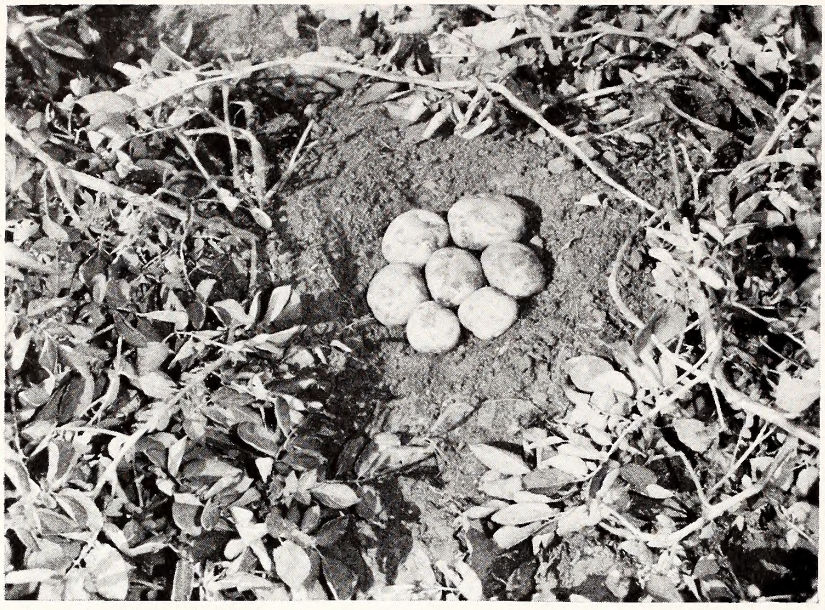
Killing Vines Before Harvest Controls Late Blight Tuber Rot

Late blight tuber rot was effectively controlled by killing diseased vines before harvest, according to L. W. Nielsen.

A general outbreak of Irish potato late blight occurred the last of May and early June in 1948. The foliage and vines of many fields were largely destroyed by mid-June. In many cases the growers dug the tubers while the diseased plants were only partially dead. By harvesting at this time spores from the foliage contaminated the tubers.

The late blight fungus does not live on dead leaves and vines. By killing diseased leaves and vines before harvest no living spores survive, and when the tubers are dug very little tuber rot will develop.

Aero defoliant and Sinox B dust were used as dusts to kill the vines. In the plot tests Sinox B killed the vines most rapidly. Aero defoliant was dusted on the commercial acreage 7 to 11 days before harvest. Those potatoes harvested from this acreage developed less than one per cent late blight tuber rot.



This is a typical hill of Snowdrift, a blight resistant variety. In this test Snowdrift yielded 475 bushels per acre.

Resistant Varieties Yield Well on Coast

Of the seven varieties of late blight-resistant Irish potatoes grown at three Tidewater locations in 1948, Snowdrift, Chenango and Kennebec performed especially well. These three varieties yielded 500, 475 and 460 bushels of U. S. No. 1 potatoes per acre, respectively.

The other four varieties included in the tests by D. T. Pope and F. D. Cochran were Empire, Fillmore, Placid and Glenmeer. All are recent introductions. Camden, Plymouth and Aurora were the three test locations.

The epidemic of late blight which occurred in eastern North Carolina in 1948 caused some reduction in yield of susceptible varieties. Irish Cobbler yielded only 331 bushels per acre, Nebraska No. 2, 284 bushels; Katahdin, 322 bushels; Sebago, 210 bushels; and La Salle, 331 bushels.

In mountain tests at Jefferson, Placid, Kennebec and Essex led with yields of 480, 460 and 450 bushels of U. S. No. 1, per acre, respectively. The standard variety now used in the mountains, Sequoia, yielded 395 bushels in these tests.

Fusarium Seed Decay Causes Poor Stands

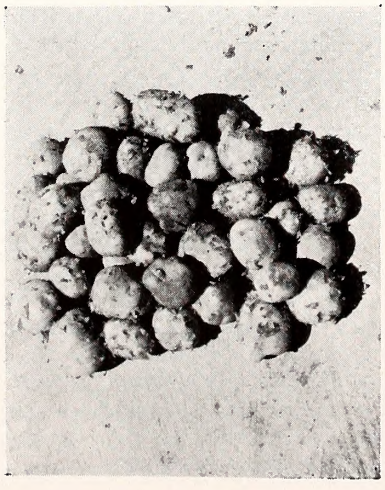
Poor stands and small weak plants observed in fields of potatoes in Camden, Tyrrell, and Beaufort Counties have been attributed to Fusarium seedpiece decay by L. W. Nielsen.

An examination of the seedpieces from missing hills or from affected plants showed that they were either totally or partially decayed. This decay, in which the affected tissues are brown and firm, started in practically all cases at the cut surfaces of the seedpiece.

Samples of affected seedpieces were studied in the laboratory, and two species of Fusarium *(Fusarium solani and F. roseum)* were found to be the cause of the decay. These fungi cause common storage rots of Irish potatoes and were probably present as contaminants on the surface of the seed potatoes. While the seedpieces were being cut, the freshly cut surfaces apparently became inoculated with the Fusaria. The decay developed after planting.

All plantings observed were not equally affected. Severity of the trouble seemed to be related to certain dates of planting. Cold wet weather is known to favor the development of this disease.

Cuts, bruises and skinning such as are shown in this picture are responsible for much of the spoilage of Irish potatoes before reaching market.



POOR HANDLING SPOILS EARLY POTATOES

Poor handling is contributing to spoilage in the marketing of early Irish potatoes, according to M. A. Abrahamson who is representing North Carolina in a cooperative regional study of the potato marketing problem. The basic objective of the study are: (1) To determine factors causing or associated with spoilage in the marketing; and (2) To evaluate the economic importance of spoilage.

Preliminary findings indicate that:

Percentage of skinning increased from about 15 per cent at the time potatoes left the field to somewhat over 30 per cent by the time they had passed over the grader.

The proportion of cuts and bruises almost doubled during this state of the marketing process, increasing from 2 per cent in the field to 4 per cent after passing over the grading machine. On the average, potatoes remained on trucks three and one-half hours from the time they were loaded in the field until they were at the grader. The time, however, varied from a low of not over 30 minutes to a high of 48 hours.

Potatoes Graded on Density Would Help Stimulate Sales

The separation of Irish potatoes by density as well as by variety and size would greatly stimulate consumer acceptance of this important locally grown crop, say N. A. Vanasse and I. D. Jones. The density of potatoes determines their adaptability to certain methods of cooking.

North Carolina-grown potatoes differ widely in density, depending on variety and location where grown. Vanasse and Jones made their density estimations by immersing the tubers in a solution of known concentration (specific gravity method).

The studies showed that for some varieties, none of the crop is suitable for baking, while still other varieties yield potatoes covering a wide range of use suitability.

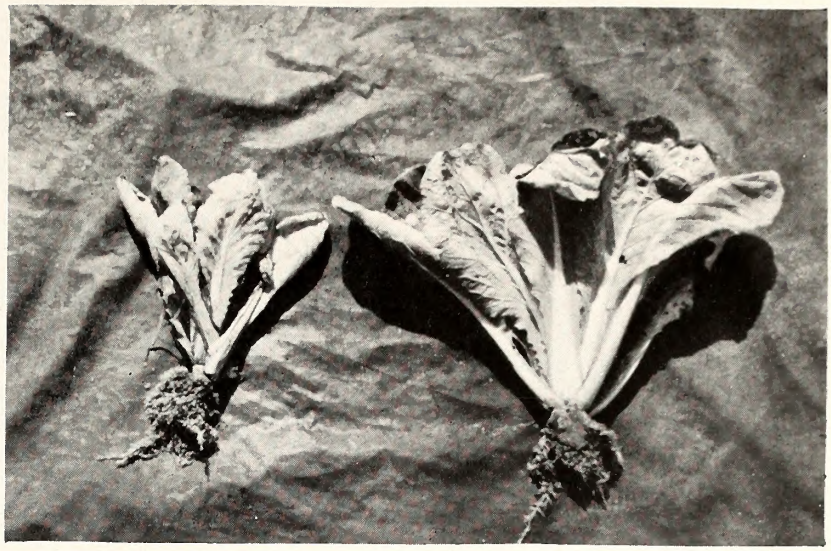
Potatoes with high levels of density have a high dry matter and starch content. In general, the more dense potatoes will be mealy when cooked and are best suited for baking. Likewise, potatoes which are less mealy when cooked are not suited for baking, but are especially suited for boiling.

Great Lakes Leads in Tests

Great Lakes continues to be the outstanding crisp-headed variety of lettuce for the southeastern part of the State, according to J. Mitchell Jenkins, Jr., of the Vegetable Research Laboratory.

This variety does not go to seed in the spring as quickly as do other commercial varieties, and it produces a hard head of good size. It seldom exhibits any tip burn—an extremely desirable characteristic in a lettuce variety for this area.

Lettuce breeding work is being continued, in cooperation with the United States Department of Agriculture. Several very good selections have been made and are being increased for further testing. One of these is a selection from USDA No. 2663. It is uniform, resistant to tip burn, and as early as Great Lakes. It will probably be named and released as soon as enough seed can be produced to supply commercial growers.



These are Chinese cabbage plants from an unsprayed plot (left) and a treated plot in a test of anthrocnose leofspot control. Spergan (4-100) was the material used.

Anthracnose Leafspot Proves Serious Disease

Anthracnose leafspot is a serious disease of turnips, radish, and Chinese cabbage in the fall and spring. Studies by D. E. Ellis and R. P. Scheffer during the past two years have shown that the fungus which causes the disease, *Colletotrichum higginsianum*, is also able able to attack to a less serious extent the following: rutabaga, broccoli, kale, brussels sprouts, kohlrabi, cabbage, collard, and mustard.

Eleven turnip varieties tested appeared to be equally susceptible. The fungus, favored by warm weather, grew best in artificial culture in laboratory at temperatures of 76 to 86° F. It was found to be seed-borne on radish. Studies are under way to determine whether or not it may be carried on the seed of other susceptible plants.

Spraying with Spergon appears to be a promising means of control. In a spray test in the spring of 1948, Chinese cabbage plants sprayed with Spergon (4-100) showed only 16 per cent infected leaves in comparison to 75 per cent for the unsprayed check. Spraying with Dithane Z-78 (2-100), Fermate (2-100), and Zerlate (2-100) also resulted in fairly good control of the disease, but these materials appeared to be somewhat less effective than Spergon.

TESTS ON STEM ANTHRACNOSE CONTINUE

Studies of the behavior and control of stem anthracnose, a serious fungus disease which causes brick-red blotches on stems, leaves and pods of lima bean, were continued by D. E. Ellis and R. S. Cox in 1948.

The fungus which is seed-borne, was found to be capable of overwintering on old lima bean plant parts under North Carolina conditions. However, fall plowing appeared to prevent this carry-over of the fungus. The disease is favored by relatively high temperatures with the fungus growing most rapidly at about 82° F.

In a spray test conducted at McCullers Branch Experiment Station, Dithane Z-78 (1.5-100) gave the best results. Phygon XL also gave good control but caused some injury to the plants. Fermate and Zerlate were less effective. Plots sprayed with Dithane Z-78 yielded more than 350 bushels of marketable green lima beans (Henderson Bush variety) in comparison to less than 200 bushels for unsprayed check plots.

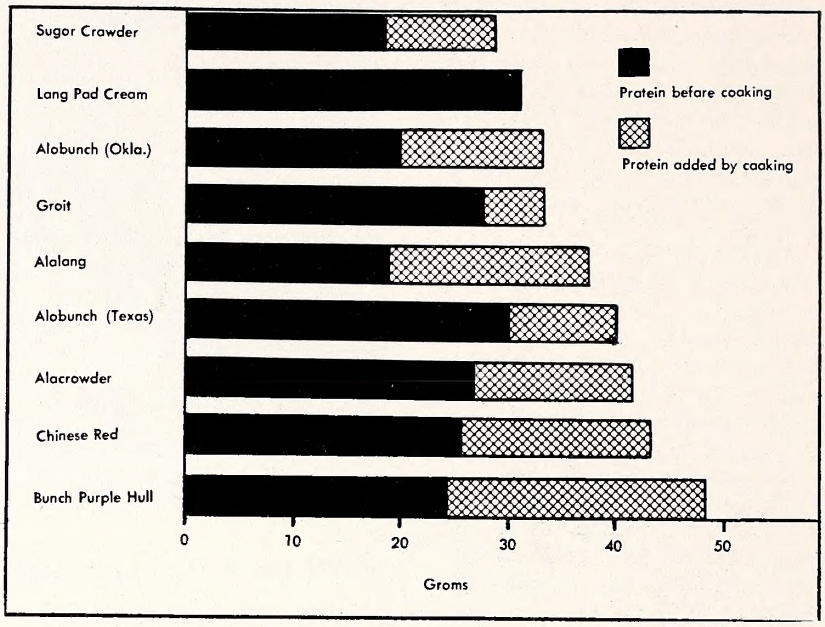
The most promising measures for controlling stem anthracnose include (1) use of disease-free seed, (2) plowing under old plant refuse in the fall, and (3) weekly applications of Dithane Z-78 (1.5-100) spray.

Cooking Improves Quality of Protein in Cowpeas

Some varieties of cowpeas contain better protein than others. Cooking improves the quality of protein in most varieties.

These are among the conclusions drawn from comparative feeding trials with the white rat in the nutrition laboratory. The experiment was conducted by F. W. Sherwood, W. J. Peterson, J. A. Weybrew, Harriet Pressly, Virginia Weldon and H. L. Lucas.

Several of the southern agricultural experiment stations have cooperated in studying the nutritive value of cowpeas grown in the South. As a part of this study, the Texas and Oklahoma Stations sent five and four samples, respectively, of different varieties. These were ground and mixed into otherwise complete diets and fed to rats as the only source of protein.



Varieties of cowpeas differ widely in protein content. Cooking increased the protein in most varieties, almost doubled the protein content of Bunch Purple Hull.

Cooking Tests

Cooking is thought to improve the quality of protein by making it more digestible, meaning that the animal gets more methionine. Methionine, which is present in the proteins of peas and beans in rather limited amounts, is necessary for the growth and well-being of all animals.

Long Pod Cream, Alabunch (grown in Texas) and Groit were the three varieties that proved to have the best protein. Those with the poorest protein were Sugar Crowder, Alalong and Alabunch (from Oklamoma). Alacrowder, Chinese Red and Bunch Purple Hull were intermediate.

Cooking improved the protein in Bunch Purple Hull to the extent that it became the best of all. The next greatest improvement was in Alalong. In contrast, there was no difference between the raw and cooked Long Pod Cream, and only a slight improvement in Groit when it was cooked.

Differences in Soil and Climate

The contradictory results from the sample of Alabunch grown in Texas as compared to that from Oklahoma cannot be explained on the basis of seed differences. Both crops were grown from the same lot of seed. Hence, the difference must be attributed to the soils or the climatic conditions. Previous results have indicated that cowpeas grown in other locations or seasons in Oklahoma may rate high in protein quality.

The rate of growth of the rats getting either raw or cooked cowpeas was considerably less than that of comparable rats on a good stock ration. When methionine was added to the raw cowpeas, the rats made nearly normal gains, showing that methionine is the chief limiting factor in cowpea protein.

EQUIPPING OF WILMINGTON LAB CONTINUES

Considerable progress was made during 1948 in equipping and improving the Vegetable Research Laboratory which was established at Wilmington in 1946. Field roads have been graded and satisfactory drainage has been provided on all of the land that is being cultivated, says J. Mitchell Jenkins, Jr., horticulturist in charge.

A portable irrigation system was purchased and is being used to provide water for vegetable and flower experiments during dry periods. Enough pipe and sprinkler heads are available to irrigate most fields being used at present for experimental purposes.

Other improvements include the enlargement of greenhouse facilities, the installation of a larger pump to supply water to the laboratory buildings, and the purchase of a small tractor with a cultivator and fertilizer distributor to facilitate the cultivation and handling of experimental plots.

Projects being conducted at the Laboratory include: fertilization studies with daffodils; tests of new gladioli varieties; lettuce breeding; and nematode resistance studies with lima beans. A number of new projects will be initiated on plant disease problems in the near future.

When used as a pre-emergence spray, 2,4-D gave excellent cantral af weeds in gladialas (abave). The check plat (belaw), untreated, was averrun.

Growers Use 2,4-D On Flowering Bulbs

Experiments with 2,4-D for the control of weeds in flowering bulbs were so successful in 1948 that many growers have already started using the weed killer on a commercial basis, reports J. Mitchell Jenkins, Jr.

The most troublesome weeds are crab grass, henbit, chickweed and Richard's weed, says Jenkins. It is extremely expensive to weed Dutch iris beds or plantings of gladioli cormels by hand. Yet until the advent of 2,4-D, hand weeding was the only practical method.

In one test at the Vegetable Research Laboratory near Wilmington, Jenkins secured good weed control in gladioli corms for a full season with a single application. He applied eight pounds of 2,4-D acid three days after the corms were planted. There was no observable injury to either the plants or flowers. Weeds controlled included goose grass, Richard's weed, crab grass and crotalaria striata.

In tests of 2,4-D on Dutch iris and daffodils, Jenkins secured good weed control from the use of three to four pounds of 2,4-D acid per acre applied not more than five days after the bulbs were planted. He finds that for best control it is important to kill the weeds at the time the seed sprout.

When 2,4-D was used as a spray after the plants had emerged, the weed seeds were not all killed, and there was injury to Dutch iris and to daffodils. Gladioli were not injured if sprayed while they were still only three to six inches tall.

NEW LIMAS SHOW HIGH NEMATODE RESISTANCE

Several of the 20 varieties and new selections of lima beans tested for nematode resistance by L. Mitchell Jenkins, Jr., have shown a high degree of resistance. Jenkins is conducting the study in cooperation with the United States Department of Agriculture.

Varieties showing high resistance include Rico 8402, Rico 1216, and 12M. Several others exhibited much more resistance than any of the standard commercial varieties. Henderson Bush, Fordhook 242, Jackson Wonder, and Sieva were susceptible.

The lima beans were planted in nematode infested soil on April 30, 1948. By August 1 all of the standard varieties were dead. The resistant varieties lived and continued to set pods until they were plowed under in October.

SUMMER BROCCOLI PLANTINGS SUCCESSFUL

Three varieties of green sprouting broccoli planted in June and July on the McCullers Station, near Raleigh, produced high yields and excellent quality, reports F. D. Cochran. The DeCicco variety produced 7350 pounds per acre, and Early Green Sprouting and Medium Green Sprouting produced 5512 pounds and 5800 pounds, respectively.

All three varieties were quite variable in type of plant and date of maturity. Selections made in 1947 were grown in 1948. Wide differences between lines have been noted, though more uniformity was obtained in some of the inbred lines. Further selections will be made in 1949.

Tests conducted by I. D. Jones during the past two years have shown North Carolina broccoli to possess excellent qualities when preserved by freezing. Texture, color and flavor of this product all were very good.

World-Wide Collection Used in Breeding Raspberries

The fourth generation of red raspberry hybrids, developed from the Chinese raspberry, Rubus biflorus, by C. F. Williams and V. H. Underwood, fruited for the first time in 1948. The progress made in improving berry characters and size is illustrated in the accompanying photo. The vigor of plant, productivity and disease resistance of these fourth generation hybrids were also excellent.

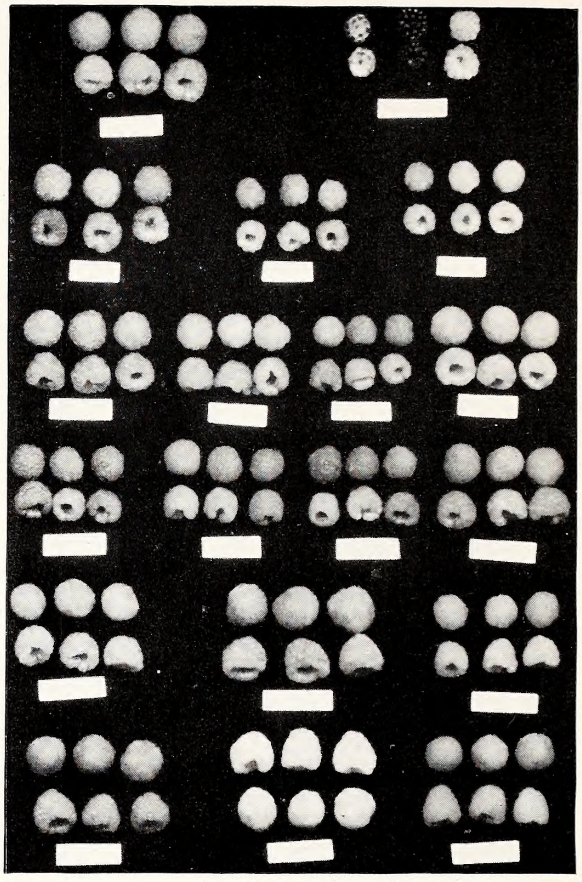
"Dixie" Introduced in 1938

The possibilities of growing hybrid red raspberries in North Carolina were first demonstrated in the hybrid variety, Dixie, introduced by the Station in 1938. This led to the development of a bramble breeding program which has included the introduction and testing of plant material from all parts of the world. Fifty-eight different species have been tried in an effort to find kinds adapted to the long growing seasons and high temperatures of this region. Although none of these species are suitable in themselves, they do have many plant and fruit characters that are extremely valuable in the breeding program.

Many of the species are well adapted and vigorous, producing plants two to three times the size of the native sorts. One from tropical India develops a spreading plant 15 to 20 feet high. Another from western China has fruit clusters of 100 or more berries each.

Hybrid Breeding Proves Successful

Hybridization has been attempted with 18 of the species and has been successful with 13 of them. Although Dixie was a first generation hybrid, it has been necessary to continue the breeding to the third and fourth generations to get the desirable combinations of characters needed in varieties for home and market use. Vigor of plant, resistance to disease, adaptation to southern climate, and soil conditions have been maintained in the hybrid progeny through four generations. At the same time, fruit size and quality have been improved to be equal to or better than that of American raspberries.



These are American and Asiatic raspberries and their hybrids, showing improvement in size, shape and cohesiveness through four generations of breeding. Row 1, American Latham (left), Asiatic Rubus biflarus (right); Row 2, 1st generation hybrids; Raw 3, 2nd; Raw 4, 3rd; and Rows 5 and 6, 4th.

Strawberries Need No Minor Elements

Minor element compounds supplementing the usual fertilizers for strawberries have not improved yields of berries, according to W. L. Lott.

Tests were conducted in twelve newly-planted commercial fields in Columbus, Pender, and Duplin Counties, with eight soil types represented. Materials tested as minor element sources were copper sulfate, 10 pounds; iron sulfate, 25 pounds; magnesium sulfate, 50 pounds; borax, 10 pounds; and ammonium molybdate, 5 pounds per acre. All the materials were applied as solutions in shallow furrows at the sides of the beds, in June and July, 1947.

No significant effects of the treatments were visible during growth and development of the beds. There was no significant effect on the number of berries picked per acre the following spring, even at the high production level of 7310 quarts.

Samples of leaves were collected from the plots and analyzed for copper, manganese, and zinc. The leaf content of copper was found to be increased by the applications at nine locations. Zinc was increased at all locations, and manganese at three of the twelve.

In view of the absence of effects on growth and yields, these leaf analyses indicate that the strawberry plants were adequately supplied with minor elements without supplementary applications. The results, thus far, do not justify recommendations for adding minor elements to the fertilizer and the farmer is spared this additional expense.

DDT Gives Good Control Of Strawberry Weevil

Five per cent DDT dust gave better control of strawberry weevil on strawberry and dewberry than the widely-used calcium arsenate and sulfur mixture, in tests conducted by B. B. Fulton. The work was started in 1946 and is continuing.

DDT is superior to the older weevil dust on three counts, says Fulton: (1) it gives better control; (2) it is less likely to burn the foliage; and (3) it gives a quicker kill — an important consideration where showers are frequent.

Field tests at two localities included the following dusts: DDT, 5 per cent; chlordan, 5 per cent; chlorinated camphene, 20 per cent; cryolite, 50 per cent; and calcium arsenate—sulfur mixture, one to five. The first three materials gave greater reductions in weevil populations three to five days after dusting than the last two.

In laboratory cage tests on dusted foliage, the first three materials caused the weevils to lose muscular coordination within three to five hours, and all weevils became moribund or dead in less than a day. With cryolite and calcium arsenate some of the weevils lived more than two days.

Whole fields dusted twice with 5 per cent DDT gave almost complete control after rather heavy initial infestations. Cases of severe burning by calcium arsenate on dewberry and strawberry leaves have been reported in recent years.

Early Strawberry Selections Excel Blakemore

In a test of 64 strawberry selections at the Willard Station, nine out of 20 early selections produced a greater yield and larger berries than Blakemore, according to E. B. Morrow and George M. Darrow.

The nine early selections averaged 196 crates per acre compared with 102 crates per acre for Blakemore. The early selections averaged 90 berries per pound while Blakemore produced much smaller berries, averaging 120 berries per pound.

If one or more of the early test selections perform as well under grower practices as in the plot tests, growers may look forward to greatly-increased production per acre for the early crop.

Blakemore has been the standard early variety in the Wallace section for many years. While it is an excellent early shipping berry, the yield is often low, and the berries become small as the season advances. There is a need for an early, productive, large-fruited variety to replace Blakemore as a companion berry to Massey.

If the 200 acres now planted in Blakemore in the Wallace section had been planted in one of the early selections, the increased production with average yields would have amounted to 18,800 crates during the 1948 season. At $8.35 per crate, the average price for the season, the increased income would have been $156,980 for Blakemore growers in the Wallace area.

New Rabbiteye Blueberries May Double Yields

Records during the past three years on 62 selections from 900 blueberry seedlings of a Hagood x Myers cross show marked advancement over the best parent in such important characters as yield, size of berry, and color of fruit, according to E. B. Morrow and George M. Darrow.

Nineteen of the selections were more productive, and 40 produced larger berries than Hagood, the better parent for yield and size of fruit. Thirty produced berries bluer than Myers, the bluest parent.

Fifteen of the 62 selections were saved for extensive propagation and testing. The average yield for the best 15 selections during the 1946-1948 seasons was 13 pints per plant. The average yield for Hagood, the most productive parent, was 7.4 pints per plant.

This is the flower cluster from the Ethel rabbiteye blueberry, one of 62 selections made from 900 seedlings of a Hagood and Myers cross. Ethel is one of the fifteen best selections which averaged 13 pints per plant during the 1946-48 seasons. Hagood, the best parent, averaged only 7.4 pints.

Grape Breeders Alter Specifications

New specifications have been drawn up for the muscadine grape of the future in the breeding program being conducted by C. F. Williams and V. H. Underwood. The new grape will be self-fertile, and the fruit will have a small scar so that it will be more attractive and less perishable.

First Plan Bunch Grapes

Early breeders, perhaps influenced by the cluster type of bunch grapes, planned a bunch Scuppernong. Their efforts led to an increase in the cluster size, but they did not attain their ideal. The fruit was difficult to harvest, and the skin tore badly. Also, because the bunch character had to be introduced by breeding with varieties of poorer quality than Scuppernong, and because male vines of unknown fruit quality were used, little or no improvement was made in fruit quality.

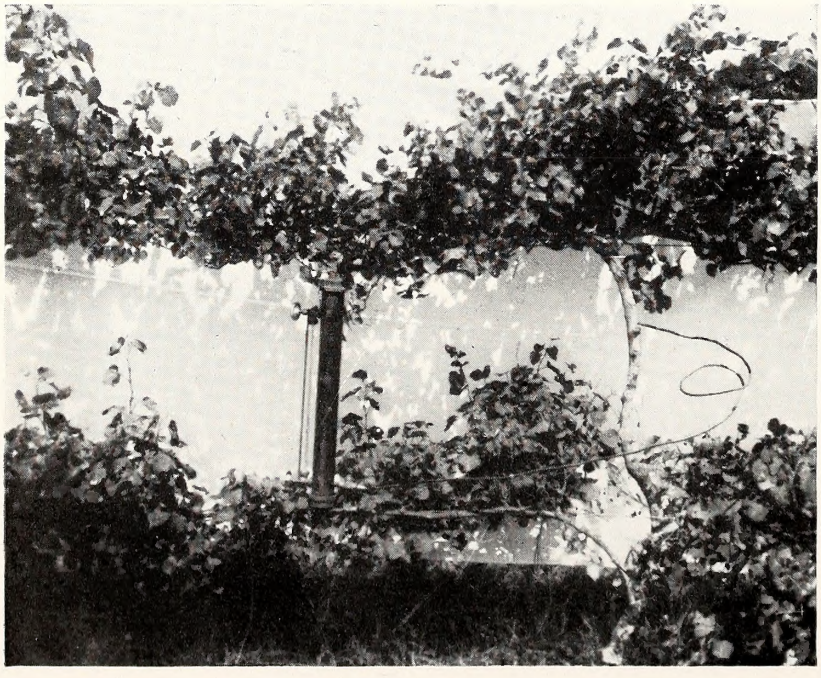
An important advancement in the breeding program came with the discovery, in a few seedlings, of perfect flower or the ability to supply pollen as well as to produce fruit. These perfect flowered sorts do not need pollen from another vine in order to set fruit. They will also provide pollen for the pistillate or female varieties.

It is now possible to cross directly two desirable fruiting plants without the intermediate step of using male plants in which the inheritable fruit characters are unknown. Seven thousand seedlings of such crosses are now being grown, half of which should have the perfect flower character.

New developments in the use of hormones may make the bunch character of less importance. A desirable grape berry, say Williams and Underwood, would be one that could be picked with a small scar and without tearing the skin. Such a grape ordinarily sheds prematurely, falls to the ground and is lost.

New Hormone Sprays Tried

Some of the new hormone sprays have been used successfully to prevent apples from dropping prematurely. Tests are being made with such sprays on Scuppernong and other muscadine grapes in attempts to prevent the early shedding of fruit and yet permit the harvesting of most of the crop at one time by jarring. Tests so far have not been entirely successful, but with the long list of hormones available, the two workers hope to develop a workable combination of variety, hormone, concentration of spray, and time of application.



Shown at the left is the apparatus used for injecting magnesium directly into the vines of muscadine grapes. The injections decreased the amount of yellowing in the leaves, known to be the result of a magnesium deficiency. In earlier tests, magnesium applied to the soil had failed to help.

Injections Help Correct Deficiency

Magnesium injected into muscadine grape vines has shown some benefit in correcting a deficiency of this element and increasing yields, according to W. L. Lott. The tests have been conducted at the Willard Station.

Fifty grams of magnesium sulfate per vine was injected as solution under pressure into the stalks of 16 vines. Fifteen of the 16 showed a marked decrease in degree of yellowing in the leaves at harvest time—a symptom of the deficiency.

The improvement in green color was found to be closely correlated with the per cent of magnesium in the leaves. Healthy vines that showed no yellowing had 0.15 per cent to 0.25 per cent magnesium in the leaves. Moderately yellowed vines had 0.10 per cent to 0.15 per cent, and vines with very yellow leaves had 0.05 per cent to 0.10 per cent magnesium in the leaves.

Two vines included in the plots treated by injection had been similarly injected the preceeding year. These two vines significantly outyielded all others in the experiment. Evidently the magnesium must be supplied earlier than blossom time of the current season to affect the yield of grapes.

Magnesium sulfate at five pounds per vine applied to the surface of the soil and in holes in the ground under the vines produced no effect the first year, either on yields of grapes or on degree of chlorosis.

Parathion, BHC Appear Effective for Curculio

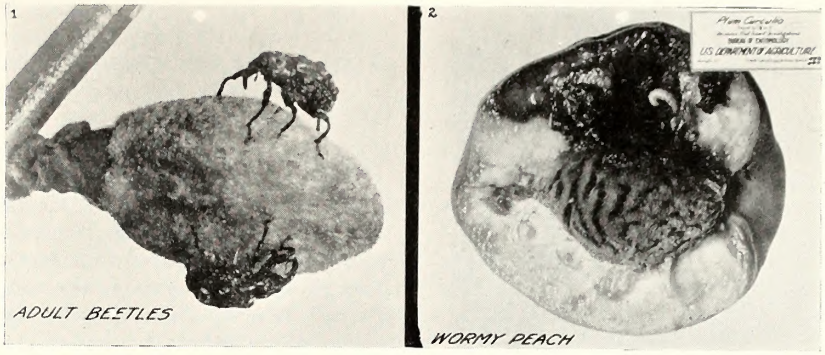
Parathion and benzene hexachloride offer the most promise of giving satisfactory control of the plum curculio, judging from the results of 1948 experiments, reports C. F. Smith.

In all, eight insecticides were included in the experiments—*Aloroco* cryolite, kryocide, *Pan-Peach* (acid lead arsenate, sulfur and safeners), chlordan, parathion, chlorinated camphene, bis (methoxyphenyl) trichloroethane and benzene hexachloride. The tests were designed to determine how quickly the materials would kill the plum curculio and how long the residue would remain effective.

Insects Caged

In the field tests, the materials were applied with a power sprayer, and the curculios were caged on the tree in sleeve-type cages. The insects were placed on the tree, ten per cage, at different times after spraying. None of the spray material was placed on these curculios.

To check the effectiveness of the materials as contact insecticides, 10 curculios were shaken for five seconds in a vial containing the solution being tested. They were then poured out on a screen, and the excess material removed by rubbing a towel on the oposite side of the screen. The insects were then placed under petri dishes over a screen frame and supplied pieces of unsprayed peach for food.



Adult plum curclios feed an yaung peaches (left), aften causing them ta drap aff. Curculia larvae damage maturing peaches (right). (Phata courtesy U.S.D.A.)

Parathion Effective

Parathion showed the most promise. As a contact insecticide it killed 100 per cent of the curculios within 24 hours when used at the rate of four ounces or more of 25 per cent wettable powder per 100 gallons of water. However, much of its effectiveness as a residual spray was lost within seven days after application. This is borne out by chemical residue analyses which have indicated that no measureable amount of parathion is left on the fruit 30 days after application.

Benzene hexachloride usually gave good knock-down, but the curculios often revived when they did not remain in contact with the material. This further emphasizes the necessity of wetting the ground as well as the tree when spraying with benzene hexachloride.

BHC Gives Off-Flavor

Benzene hexachloride, when used as a spray on peach trees later than 90 days before harvesting, was found to impart a definite off-flavor to both fresh and canned fruit. Benzene hexachloride is one of several insecticides included in tests for off-flavor made by C. F. Smith, I. D. Jones and J. A. Rigney.

When the insecticide was used only in the petal-fall or shuck-off sprays, it gave a slight off-flavor to the fresh fruit. None was detected in the canned fruit.

Neither parathion, chlordan nor chlorinated camphene caused off-flavor in either fresh or canned fruit when applied in five different sprays.

New Rootstock Shows Promise

A North African rootstock may increase peach orchard yields by twenty-five bushels per acre at no extra cost.

This stock has consistently yielded ¼ bushel per tree higher than any other stock under test in the Halehaven block at the Peach Research Laboratory. A Bureau of Plant Industry introduction from Africa, the stock is still under preliminary tests, but it may well become the leading stock for the Sandhills area if its present performance continues.

Besides higher yields, the trees on this stock are larger and more vigorous. None have died over a six-year period.

Summer Treatments Control Peach Borers

Summer treatments of peach orchards with DDT and/or parathion gave good control of peachtree borers and offered the added advantage of killing the insects before they could damage the trees, reports C. F. Smith. The most commonly used materials for borer control have been ethylene dichloride and propylene dichloride.

Smith set up the 1948 experiments to determine the number of applications of DDT and/or parathion which would be necessary. He also sought the proper time for applications.

In this test be obtained good control with three or four applications of DDT, four applications of parathion or two applications (July 13 and August 13) of DDT and parathion. The control with these materials compared favorably with the control obtained with either ethylene dichloride or propylene dichloride.

DDT was used at the rate of eight pounds of 50 per cent wettable powder and parathion at the rate of two pounds of 25 per cent wettable powder per 100 gallons of water.

Clay Affects Phosphorus Movement

It has long been known that phosphorus is held very tightly by the soil. There have been indications that the element stays where it is put.

However, experiments conducted by D. P. Satchell, N. T. Coleman and N. S. Hall on Cecil and Norfolk soils have demonstrated that fertilizer phosphate does move through the soil. The tests indicate that the movement is affected by the clay content of the soil, the soil phosphorus level and by the source of fertilizer material.

Under average soil phosphorus conditions, added phosphorus may be expected to move as much as one inch. If the soil phosphorus is increased or decreased, this movement is changed. The movement is greater on soils having a lower clay content. Insoluable compounds like dicalcium and tricalcium phosphate move less than superphosphate.

The mobility of elements in soil is very important to plants. If an element is not free to move then the plant roots must contact it in their extension through the soil. This means that phosphorus must be scattered throughout the soil, since the roots will not seek it out.

Satchell, Coleman and Hall believe that the level of soil phosphorus should be raised to at least double the present figure, in view of the role it plays in getting good utilization. They also recommend increasing the rate of application when insoluable phosphate compounds are used.

Rapid Movement Explains Boron Deficiency

One reason why boron deficiency shows up more quickly on sandy soils than on clay soils has been found in experiments by W. W. Woodhouse, Jr. and R. L. Lovvorn.

The two workers applied borax to a Norfolk sandy loam and a Cecil clay loam at the rate of 20 pounds per acre. Six months later they sampled the soil down to depths of 24 inches and analyzed for boron content.

On the sandy loam most of the applied boron had moved down into the 8 to 16 and 16 to 24-inch zones of the soil with a relatively small part being retained in the plow layer. This indicates a rather rapid movement of boron into the subsoil of sandy soils. Annual topdressings of borax seem necessary where crops such as alfalfa are grown on these soils.

In contrast, the clay loam had retained most of the application in the 0 to 8-inch layer with only slight movements to the deeper zones. Borax applications should last considerably longer on this soil than on the more sandy types where much of the application may get out of reach of the crop roots in a year's time.

New Lime Evaluation Method

How important to crop growth is the degree of fineness of limestone?

A. Mehlich and J. Fielding Reed report that the answer to this question depends on (1) the original acidity of the soil; and (2) the lime requirements of the crop to be grown. The greater the lime requirement, the more necessary it is to use finely-divided limestone, particularly if the soil is very acid. With crops that do not have a very high lime requirement, it becomes less important to add very finely-divided lime.

To arrive at these conclusions, Mehlich and Reed conducted a series of tests under controlled conditions in the greenhouse and in out-door frames. They found that the rate of plant reaction to dolomitic limestone which does not pass a 10-mesh sieve is very slow, even on extremely acid soils. On the other hand, dolomitic material which passes a 40 but is retained by a 100-mesh sieve is nearly as effective on acid soils as that which passes a 100-mesh sieve.

DRAINAGE METHODS TESTED AT TWO LOCATIONS

Two methods of drainage, with variations in depth and spacing, are being tested by E. G. Diseker and J. F. Lutz at eleven different locations in eastern North Carolina. Seven methods of drainage are under continuous observation at two locations, one at the Tidewater Experiment Station near Plymouth and the other on the J. V. Taylor farm near Bethel. Bladen, Bayboro, Coxville, Lynchburg, Elkton, Fallington, Portsmouth and Othello soils are represented.

Deeper Drainage With Tile

All drainage methods have been satisfactory during the past two years at Plymouth. Deeper drainage was obtained with tile and open ditches than with V-ditches and bed drains. Excellent drainage was afforded by tile lines spaced as far apart as 100 feet and by ditches with spacing as great as 230 feet. All plots produced high yields of corn.

The three best methods of drainage at Bethel, in order of their efficiency, were (1) tile at three-foot depths; (2) open ditches at three-foot depths; and (3) tile at two-foot depths.

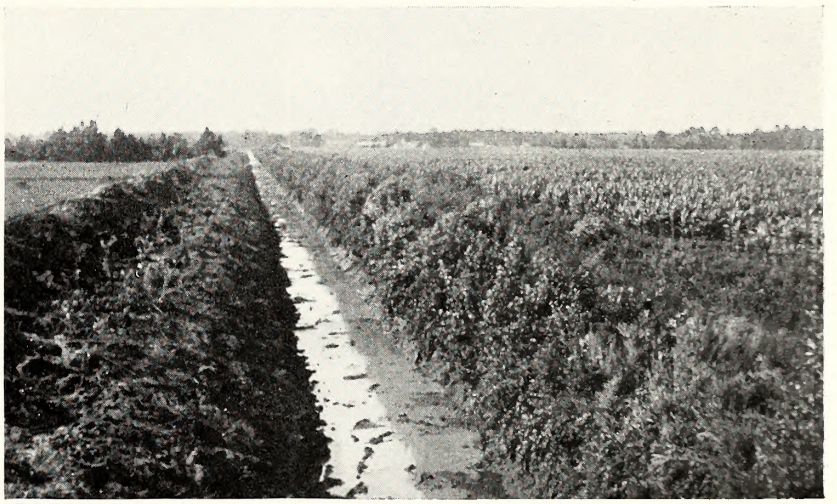
Open ditches should be dug so that their sides have at least a ½ to 1 slope, Lutz and Diseker have learned. Ditches with vertical banks are unstable and costly to maintain. The cost for cleaning out small drainage ditches with hand shovels amounted to 16 cents per linear yard where side slope was ½ to 1. Cleaning out ditches with vertical banks cost 1.36 cents per linear yard with labor at 50 cents per hour in both cases.

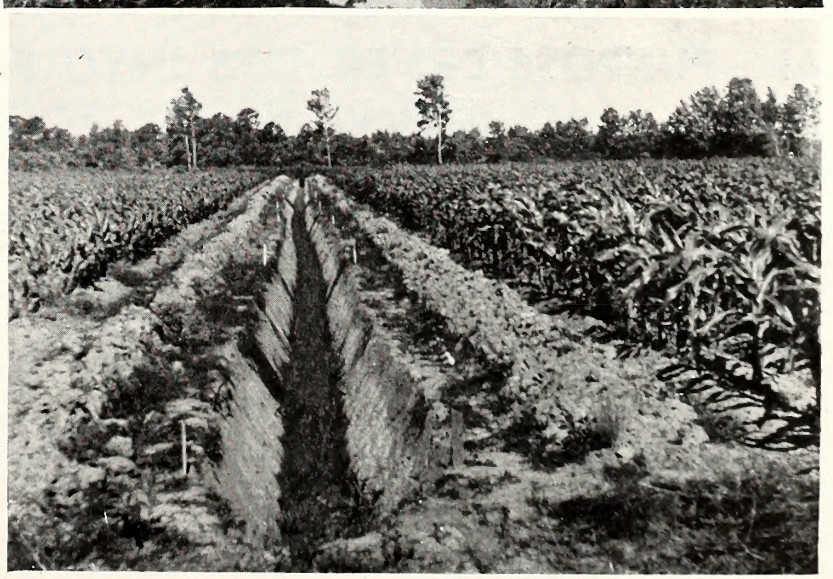
Other Studies

The drainage tests at Bethel and Plymouth are supplemented with studies by J. F. Lutz and C. E. Scarsbrook on soil water and on the physical properties of soils. First, they are determining the physical properties which cause some soils to drain better than others. Secondly, they are measuring the effects of the various drainage methods on certain physical properties of the soils.

The following characteristics are being observed: (1) soil water in the field; (2) mechanical analyses of the soils and subsoils; (3) aggregation; (4) total porosity and pore-size distribution; and (5) degree of compaction.

A canal has been opened up at Plymouth (top) for a distance of almost two miles, providing a needed outlet for drainage. Drainage ditches with sloping sides (bottom) can be cleaned at about one-eighth the cost of ditches with vertical banks.





Acidity, Crop Requirements

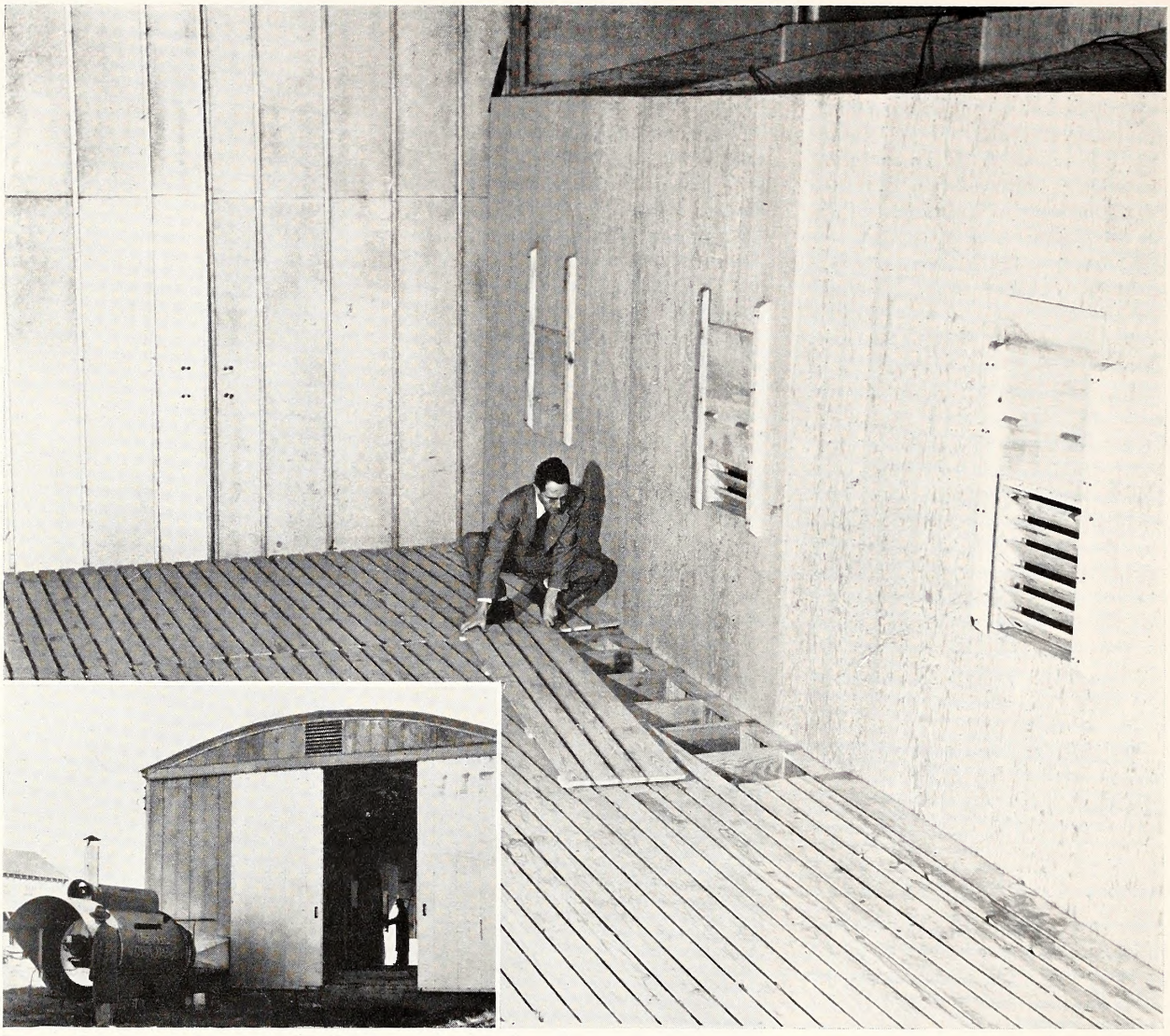
A new method for evaluating the lime requirements of different plant species, has been devised by A. Mehlich and J. F. Reed.

Older methods have simply involved classifying the plants into general groups having either a high lime requirement, a medium lime requirement, or a low lime requirement. There has been no means of assigning an actual numerical value that would indicate the lime needs of the crop.

The new method, developed in laboratory and greenhouse tests, takes into account both the total minerals (cations) in the plant and the ratio they bear to one another. For example, the following values have been assigned to these crops:

Alfalfa	0.3
Cotton	0.3
Red Clover	0.4
Soybeans	0.6
Oats	4.0
Timothy	9.0

The lower the value, the higher the lime requirement.



This crop drying building (inset) will accommodate about 700 bushels. The interior is so constructed that it will dry hay on the slatted floor at the same time peanuts, small grain or corn is being dried in the side bins.

ALL-PURPOSE DRYER FITS INTO FARM OPERATIONS

A farm dryer designed for a single crop is impractical on farms where more than one crop requires drying at harvest time. Since there are, at present, very few corn cribs and graneries on North Carolina farms, J. W. Weaver, Jr., S. H. Usry and N. C. Teter believe that a building in which all crops can be dried with heated air will fit into the practical operation of many farms.

A study of crop production and distribution in North Carolina shows ten principal crops which sometimes or always need drying or curing at harvest time. These ten are tobacco, corn, hay, small grain, peanuts, cotton, sweet potatoes, soybeans for beans, lespedeza for seed and Irish potatoes.

Eight are grown in clearly defined areas, with considerable overlapping of one area upon another. Seventy-four of the 100 counties in the State grow one or more of these principal crops. Twenty-one counties grow from five to seven. There is a potential need for artificially drying or curing at least three other crops in each principal crop area.

It appears possible to design a dryer for all principal crops, with the possible exception of tobacco and Irish potatoes. Such a dryer might be accommodated in a building 24 by 40 by 12 feet. On some farms it could be kept in profitable operation from eight to ten months of the year.

Two all-crop dryers have been built on farms in the State and will be used for the first time in 1949. Several others are under construction for the 1949 season. If this drying building is practical for only five per cent of the farms in North Carolina, there is a potential of 12,500 installations.

Wildlife Commission, Station Join To Check Warble Fly Infestation

Almost three-fourths of the grey squirrels killed during a survey the first two weeks of September, 1947, were infested with warble fly larvae. The survey, made by Ray Allison, is part of a cooperative project carried out by the Station and the North Carolina Wildlife Resources Commission. The project, financed under the Federal Aid to Wildlife Restoration Act (Pittman-Robertson), is aimed at securing information on management of the animal.

Hunting Season Survey

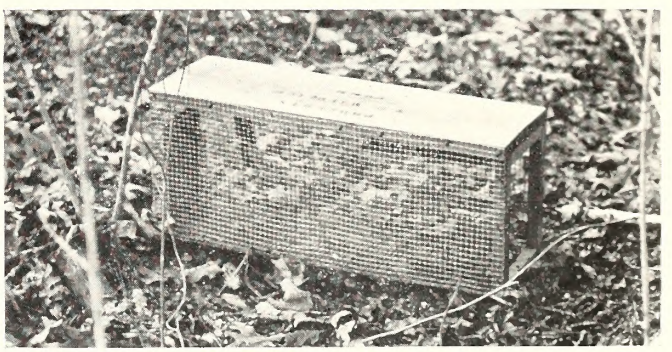
Allison repeated the survey in 1948. However, the 1948-49 hunting season was set two weeks later, and preliminary data indicate that only 13 per cent of the bag was infected. Allison also observed that a large portion of adult females are still nursing young in the nest during late August and early September. An early hunting season invariably results in the loss of many young animals by starvation plus the throwing away of the infested squirrels.

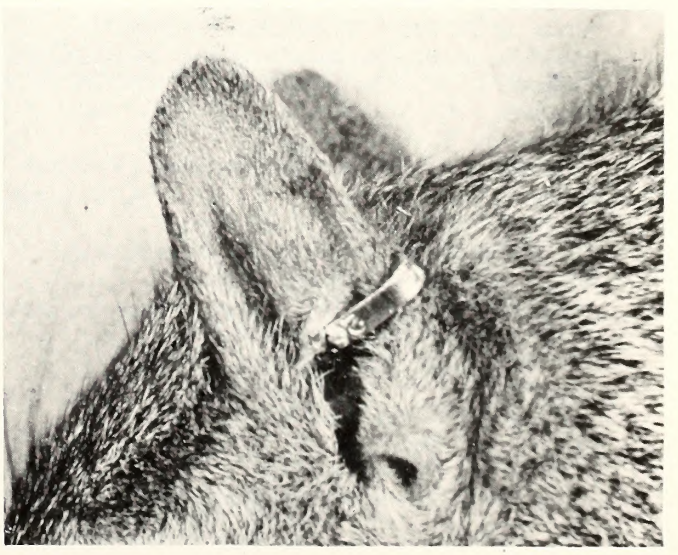
Many hunters prefer to kill squirrels during the early season, since the animals are easier to hunt while they are cutting hickory nuts and acorns. They are also in the corn fields and may do considerable local damage to corn while it is in the "milk" stage.

Live Trapping

To gain more factual information on managing the grey squirrel, Allison has begun a live trapping and tagging program. To date, the worker has taken 24 different squirrels a total of 76 times in live traps of his own design.

Each trapped squirrel is tagged with a small numbered ear tag so that it may be identified on later recovery. It is only by following tagged animals through several seasons that adequate information can be obtained on the squirrel population. The trapping program has already provided much valuable information.





Gray squirrels damage corn (top) when it is in the "milk stage." This is often the reason why farmers hunt squirrels early in the season. The photo was taken on August 26.

A live trap (center), designed by Ray Allison, is used to catch squirrels in the research area. The project is a cooperative study aided by the State Wildlife Commission.

A small metal tab (bottom) is placed in the ear of each animal when it is caught. This provides a means of identification, permits o check on squirrel numbers and fly infestation.

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January 1, 1949

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Forest Products Laboratory

Soil Conservation Service
Conservation Experiment Station Division
Nursery Division

Tennessee Valley Authority
Agricultural Relations Department

Publications

Experiment Station Bulletins and Progress Reports

Blow, W. L. *Progeny Testing—Key to Egg Profits* Research and Farming, 6:2, Jan., 1948.

Brady, D. E. *Good Packaging Prolongs Fresh Life of Frozen Meats.* Ibid., 7:1, July, 1948.

Brown, O. A. and Weldon, N. W. *Cut-Rate Tobacco Curing.* Ibid.

Clayton, C. N. and Smith, C. F. *Apple Spray Information for 1948.* Special Cir. No. 6, Jan., 1948.

Cotton, W. P. *Dairy Industry Faces Marketing Problem.* Research and Farming, 7:1, July, 1948.

Dearstyne, R. S., Lucas, H. L., Jr., and Bostian, C. H. *Blackhead in Young Turkeys.* Ibid., 7:2, Oct., 1948.

Dillard, E. U. *Full Feed Beef for Highest Gains.* Ibid.

Ellis, D. E. and Cox, R. S. *Dusting Cucumbers to Control Downy Mildew.* Bul. No. 362, April, 1948.

Greaves, R. E., Cox, B. F. and Dearstyne, R. S. *Diagnosis Records Reveal Major Diseases.* Research and Farming, 7:2, Oct., 1948.

———. *Worms Get the Early Birds.* Ibid., 7:1, July, 1948.

Green, R. E. L., *King Cotton Goes Mechanical.* Ibid., 6:2, Jan., 1948.

Hamilton, C. H. *Farm Living Level Improves.* Ibid., 7:1, July, 1948.

Jenkins, J. M. Jr., *Station Resumes Flower Research.* Ibid., 6:2, Jan., 1948.

Jensen, J. H. Control Blue Mold. Ibid., 6:2, Jan., 1948.

Kulash, W. M. *Wireworm—Enemy of Row Crops.* Ibid., 7:2, Oct., 1948.

Lovvorn, R. L. and Piland, J. R. *Grassland Farming Pays—In More Ways Than One.* Ibid., 6:2, Jan., 1948.

——— and Woodhouse, W. W., Jr. *Ladino is Here to Stay.* Ibid., 7:1, July, 1948.

Mayo, S. C. *The Farmer Needs A Home.* Ibid., 6:2, Jan., 1948.

——— and Fullerton, K. S. *Medical Care in Greene County.* Bul. No. 363, Nov., 1948.

Moore, R. P. *Good Seed Boosts Corn Yields.* Research and Farming, 6:2, Jan., 1948.

Pope, D. T. *Unpredictable Sweet Puzzles Breeders.* Ibid., 7:1, July, 1948.

Rankin, W. H. *The Teamwork of Small Grain Practices.* Ibid.

Roberts, W. M., Colvard, C. D. and Effland, Stella. *Stabilizers, Cocoa Powders Affect Quality of Chocolate Milk.* Ibid., 7:2, Oct., 1948.

Robinson, H. F., Rigney, J. A. and Harvey, P. H. *Investigations in Peanut Plot Technique.* Tech. Bul. No. 86, Jan., 1948.

Smith, C. F. *Pea Aphid Control in North Carolina.* Special Cir. No. 7, April, 1948.

——— and Clayton, C. N. *Peach Spray Information for 1948.* Special Cir. No. 5, Jan., 1948.

Wesson, W. and Abrahamsen, M. A. *Co-ops Keep Pace with Dairy Industry.* Research and Farming, 7:2, Oct., 1948.

Williams, C. F. *New Grape Varieties Serve Dual Purpose.* Ibid., 6:2, Jan., 1948.

Scientific Journal Articles

Abrahamsen, Martin A. *The Establishment of Business Research Programs With Special Reference to Farmers Regional Purchasing Associations.* Journal of Marketing, 12:348-361, Jan., 1948.

———. *Impediments to Effective Research Under the Research and Marketing Act.* Proc. Assoc. of Southern Agr. Workers, pp. 12-14, Feb. 12-14, 1948.

———. *Marketing Research in Agriculture.* Southern Economic Journal, 15:80-85, July, 1948.

Anderson, R. L. *Use of Variance Components in the Analysis of Hog Prices in Two Markets.* Jour. Am. Stat. Assoc. 42:612-634, Dec., 1947.

——— and Manning, H. L. *An Experimental Design Used to Estimate the Optimum Planting Date for Cotton.* Biometrics 4, No. 3:171-196. Sept., 1948.

——— *The Use of Regression Techniques with Economic Data.* Proc. of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences, pp. 3-14, Sept. 7-9, 1948.

——— *A Report on the Southern Regional Farm-Food Consumption Survey.* Proceedings of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences, p. 21, Sept. 7-9, 1948.

Arbuckle, W. S., Redfern, R. B., and Blanton, L. F. *Observations on the Effects of Various Stabilizing and Emulsifying Materials on the Properties of Ice Cream.* (Abstract) J: Dairy Sci. 31:8, p. 703, Aug., 1948.

Brady, N. C., Feed, J. F., and Colwell, W. E. *The Effect of Certain Mineral Elements on Peanut Fruit Filling.* J. Am. Soc. Agron., 40: 156-169, 1948.

Clayton, C. N. *Effect of Several Seed Protectants on Emergence and Stand of Okra.* Phytopathology 38: 102-105, Feb., 1948.

Cochran. W. G. and Bliss, C. I. *Discriminant Functions with Covariance.* Ann. Math. Stat. XIX, 2:151-176, June, 1948.

Comstock, R. E., Peterson, W. J. and Stewart, H. A. *An Application of the Balanced Lattice Design in a Feeding Trial with Swine.* Jour. Anim. Sci., N 7, No. 3:320-331, Aug., 1948.

——— and Stewart, H. A. *A Comparison of Inbred Lines of Swine Based on their Performance in Topcrosses* (Abstract). Jour. Anim. Sci. 7, No. 4:515-516, Sept., 1948.

——— *Statistics in Animal Breeding Research.* Proceedings of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences. p. 74-76. Sept. 7-9, 1948.

Cox, Gertrude M. *A Proposed Statistical Plan for the Southeastern States.* Proceedings of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences. pp. 26-36, Sept. 7-9, 1948.

Cox, R. S. *Stem Anthracnose of Lima Bean and Its Control.* Phytopath. (Abs.), 38:7, 1948.

Dean, L. A., Nelson, W. L., MacKenzie, A. J., Armiger, W. H., and Hill, W. L. *Application of Radioactive Tracer Technique to Studies of Phosphatic Fertilizer Utilization by Crops: 1. Greenhouse Ex-*
1948.
periments. Soil Sci. Soc. Amer. Proc., 12:107-112.

Ellis, D. E. and Clayton, C. N. *Soil Treatments with New Insecticide In-effective in Control of Root-knot.* Plant Dis. Rept., 32:476-477, 1948.

——— and Clayton, C. N. *Myeosphaerella Rosigena on Greenhouse Roses.* Plant Dis. Rept., 32:9-10, Jan., 1948.

Etchells, J. L. and Jones, I. D. *Bacteriological Changes During Fermentation of Steamed Potatoes for Silage.* Jour. of Ag. Res., Vol. 78, Nos. 1 and 2, 1949.

———— ———— *Bacteriological Changes During the Fermentation of Certain Brined and Salted Vegetables.* U. S. Dept. Agr. Tech. Bul. 947, Oct., 1947.

Garris, H. R. and Ellis, D. E. *Notes on Cabbage Black Rot in North Carolina.* Plant Disease Reporter, 32: 451-452, 1948.

Glazener, E. W., and Briggs, G. M. *Further Studies in Abnormal Blackening of Feathers of Vitamin D Deficient Chicks (Genetic and Endocrine Approach).* Poultry Science, 27:462-466, 1948.

————————, and Shaffner, C. S. *Thyroid Activity as Related to Strain Differences in Growing Chickens. (Abstract).* Poultry Science, 27:664, 1948.

Glazener, J. O., Hostetler, E. H. and Smith, F. H. *Methods of Feeding Soybeans and Their Supplementation in a Hogging-off Program.* Jour. Animal Sci., 6:4, Nov., 1947.

Hanna, W. J., and Reed, J. F. *A Comparison of Ammonium Acetate and Buffered Barium Chloride Methods for Determining Cation-exchange Properties of Limed Soils.* Soil Sci., 66:447-459, 1948.

Hebert, T. T. and Middleton, G. K. *Mosaic of Barley in North Carolina.* Plant Disease Reporter, 32:435-436, 1948.

————————, Rankin, W. H. and Middleton, G. K. *Interaction of Nitrogen Fertilization and Powdery Mildew on Yield of Wheat.* Phytopath. (Abs.), *38:* 569-570, 1948.

James, H. B. *What John Smith Needs to Know About the Benefits and Costs of Soil Conservation.* J. Farm Econ., 1948.

———————— *What's Ahead for Tobacco?* Pro. Assoc. of Southern Agr. Workers, pp. 130-131, Feb. 12-14, 1948.

Klingman, G. C. *Will Chemical Weed Killing Replace Cultivation?* What's New in Crops and Soils, Oct., 1948.

Krantz, B. A. and Harvey, P. H. *How to Get that New Hybrid Sooner.* What's New in Crops and Soils (Amer. Soc. of Agron.), 1:1, pp. 19-20, Oct., 1948.

———————— *Comparison of Rate, Time and Method of Applying Nitrogen to Corn in North Carolina.* Soil Sci. Soc. Amer. Proc., 1947 (in press).

Kulash, W. M. *New Insecticides for Corn Earworm Control.* Jour. Econ. Ent., 41(3):387-9, 1948.

———————— *The Control of the Rice Weevil and the Angoumois Grain Moth.* Jour. Econ. Ent., 41(5):715-8, 1948.

———————— *Dust Treatments for Fall Armyworm Control in North Carolina.* Jour. Econ. Ent. 1(5):322-3, 1948.

Lehman, S. G. and Garriss, H. R. *Verticillium Wilt of Cotton Discovered in North Carolina.* Plant Dis. Rept., *32*:88-91, March, 1948.

———————— and Graham, J. H. *Results from Dusting Soybeans with Copper in 1947.* Phytopath. (Abs.), *38*:570, July, 1948.

———————— *Soybean Seed Treatment Tests in North Carolina in 1947.* Phytopath. (Abs.), *38*: 571, July, 1948.

Lovvorn, R. L. and Woodhouse, W. W., Jr. *Ladino Clover Moves South.* What's New in Crops and Soils, Amer. Soc. Agron., Dec., 1948.

Lucas, H. L. *Techniques in Animal Science Research.* Proc. of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences. pp. 62-73, Sept. 7-9, 1948.

———————— *Designs in Animal Science Research.* Proc. of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences. pp. 77-86, Sept., 7-9, 1948.

Matrone, G., Lovvorn, R. L., Peterson, W. J., Smith, F. H., and Weybrew, J. A. *Studies of the Effect of Phosphate Fertilization on the Nutritive Value of Certain Forages for Sheep.* Jour. Animal Sci. (In press).

Mayo, Selz C. *Two Population Characteristics of County-Seat Towns In North Carolina.* Rural Sociology, 12:4, pp. 423-426, Dec., 1947.

Mehlich, A. *Determination of Cation and Anion-exchange Properties of Soil.* Soil Sci., 66:429-445, 1948.

———————— and Reed, J. Fielding *Effects of Cation-exchange Properties of Soil on the Cation Content of Plants.* Soil Sci., 66:289-306, 1948.

Middleton, G. K., Hebert, T. T. and Klingman, G. C. *How Do Oat Varieties React to 2,4-D?* What's New in Crops and Soils. Dec., 1948.

McKenzie, Howard L., Gill, L. S. and Ellis, Don E. *The Prescott Scale (Matsucoccus vexillorum) and Associated Organisms that Cause Flagging Injury to Ponderosa Pine in the Southwest.* Jour. Agr. Res., 76:33-51, 1948.

McVay, F. E. *Sample Methods Applied to Estimating Numbers of Commercial Orchards in a Commercial Peach Area.* Jour. Am. Stat. Assoc., 42:533-540, Dec., 1947.

Nelson, W. L., Krantz, B. A., Colwell, W. E., Hawkins, Arthur, Woltz, W. G., Dean, L. A., MacKenzie, A. J. and Rubins, E. G. *Application of Tracer Technique to Studies of Phosphatic Fertilizer Utilization by Crops: II. Field Experiments.* Soil Sci. Soc. Amer. Proc., 12:113-118, 1947.

————————, and Hartwig, E. E. *Profitable Soybean Yields in the Southeast.* What's New in Crops and Soils, 1:8-10, 1948.

————————, Krantz, B. A., Colwell, W. E., Woltz, W. G., Hawkins, Arthur, Dean, L. A., MacKenzie, A. J., and Rubins, E. J. *Application of Radioactive Tracer Technique to Studies of Phosphatic Fertilizer Utilization by Crops: II Field Experiments.* Soil Sci. Soc. Amer. Proc. 12:113-118, 1948.

———————— *The Effect of Nitrogen, Phosphorous and Potash on Certain Lint and Seed Properties of Cotton.* Jour. Amer. Soc. Agron. (In press).

Pressly, Harriet *Influence of Cooking on the Ascorbic Acid Content of Collards.* Food Research. (In press).

Peterson, W. J., Comstock, R. E., Stewart, H. A., Hostetler, E. H. and Smith, F. H. *Cystine and Vitamins of the B-Complex as Supplements to Raw Soybeans in Pig Rations.* Jour. Animal Sci., 7:341-350, Aug., 1948.

Reed, J. F. and Cummings, R. W. *Use of Soluble Sources of Calcium in Plant Growth.* Soil Sci., 65:103-109, 1948.

————————, and Brady, N. C. *Time and Method of Applying Calcium As a Factor Effecting Production of Peanuts.* J. Am. Soc. Agron., 40:980-997, 1948.

Rigney, J. A., Miles, S. R. and Andrews, W. B. *The Choice of Suitable Experimental Units and Experimental Designs.* Proc. of Twenty-Third Annual Meeting of the National Joint Committee on Fertilizer Applications, 228-234, Dec., 1947.

———————— *Techniques in Field Plot Experimentation.* Proc. of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences, pp. 39-44, Sept. 7-9, 1948.

Smith, Clyde F. *A New Aphid On Sweet Potatoes.* Florida Entomologist, 31(1):24-26, 1948.

———————— *Plum Curculio Control in North Carolina.* Journ. Econ. Ent., 41(2):220-227, 1948.

Speck, Marvin L., Colvard, Charles D., and Shumaker, M. Lee. *Some Observations on the Efficiency of High-Temperature Short Time Pasturization of Chocolate Milk,* (Abstract) Jour. of Dairy Sci., *31*:707-708, 1948. Paper presented at the 43rd annual meeting of Amer. Dairy Sci. Assoc. Athens, Ga., 1948.

Weybrew, J. A., Stewart, H. A., Matrone, G. and Peterson, W. J. *Supplemented Milk Diets for Young Pigs in Cages.* Jour. Animal Sci. (In press).

Williams, C. F., and Veerhoff, Otto V. *Response of Peach Trees to Boron.* Amer. Soc. Hort. Sci., 52: pp. 88-96, 1948.

Miscellaneous

Abrahamsen, Martin A. *If Marketing Costs Were Cut.* Southern Agriculturist, May, 1948.

——————— *Why Marketing Costs are High.* Southern Agriculturist, June, 1948.

——————— *You Can Cut Your Marketing Costs.* Southern Agriculturist, July, 1948.

——————— *Is a Roadside Market the Thing For You?* Southern Agriculturist, Aug., 1948.

——————— *They Take It to Town.* Southern Agriculturist, Sept., 1948.

——————— and Scroggs, Claud *Tarheelers See Advantages but Need More Information.* News for Farmer Cooperatives, Sept., 1948.

——————— *Housewives Know What They Want.* Southern Agriculturist, Oct., 1948.

——————— *Mechanical Harvesting—What It Means to Cotton Marketing.* Southern Agriculturist, Nov., 1948.

Arbuckle, W. S. *Importance of Proper Stabilization in the Production of Quality Ice Cream.* National Assoc. of Retail Ice Cream Manuf. Bul., Nov., 1948. Confectionery-Ice Cream World, 40:23, pp. 26, Dec., 1948.

——————— *Will Egg Products Improve Ice Cream?* Ice Cream Field, 3:6, pp. 24, 25, Dec., 1948.

——————— *Iee Cream is a Nutritious Wholesome and Satisfying Food.* The Employment Security Commission Quarterly, 6:2,3, pp. 55 and 73, 1948.

Bennett, R. R. and Teter, N. C. *Tobacco Barn Fire Loss Summary, North Carolina 1947.* Extension Folder No. 72, April, 1948.

Brown, O. A. and Weldon, N. W. *Curing Bright Leaf Tobacco.* The Carolina Farmer, 1948.

Blumer, T. N. *The Right Way to Cure Meat.* "Carolina Cooperator" Dec., 1948.

Chamblee, D. S. and Dobson, S. H. *Seedbed Preparation For Pastures and Alfalfa.* Progressive Farmer, Sept., 1948.

Colvard, D. W. *Why North Carolina Needs More Pastures.* The Progressive Farmer, June, 1948.

——————— *Ladino Clover and Orchard Grass Move Into the Cotton Belt.* Hoard's Dairyman, Sept. 10, 1948.

——————— *State Dairying Business Growing and Changing.* The Employment Security Commission of North Carolina, 6:2, 3, 1948.

Dearstyne, R. S. and Bostian, C. H. *Breeding for More Eggs.* The Turkey World, Oct., 1948.

Dobson, S. H. and Lovvorn, R. L. *Inoculation of Legumes.* N. C. Agr. Extension Cir. 309, Jan., 1948.

——————— *Seedbed Preparation.* N. C. Agr. Extension Cir. 308, Feb., 1948.

Ellis, H. M., and Weaver, J. W., Jr. *Drying Crops with a Flue Tobacco Barn.* Exten. Cir. 328, Oct., 1948.

Hamilton, C. Horace *How Can Farm Folks Get Better Hospital and Better Medical Care?* Progressive Farmer, Oct., 1948.

——————— *Rural Medical Care.* Better Health (N. C.) June-July, 1948.

——————— and Staff. *Farm Tenancy: East Up, West Down.* Univ. of N. C. News Letter, May 5, 1948.

Jenkins, J. Mitchell, Jr. *Soil Fertility Problems on Coastal Soils.* Market Growers Jour., March, 1948.

——————— *Control Downy Mildew for Better Quality Cantaloupes.* Market Growers Jour. June, 1948.

——————— *Great Lakes Lettuce for Coastal North Carolina.* Market Growers Jour., Nov., 1948.

——————— *North Carolina Grows Many Kinds of Vegetables.* Market Growers Jour., Dec., 1948.

Krantz, B. A., Nelson, W. L. and Burkhart, L. *Plant Tissue Tests as a Tool in Agronomic Research.* Chapter VI in Diagnostic Techniques for Soils and Crops. Published by Amer. Potash Institute, 1948.

——————— and Harvey, P. H. *Fertilization and Spacing Studies on Corn Inbreds.* Research Report No. 122 of Division of Soil Management and Irrigation and Div. of Cereal Crops and Diseases, Bur. Plant Industry, Soils, and Agr. Eng., U.S.D.A., in cooperation with the N. C. Agr. Exp. Sta.

Lovvorn, R. L. *Pasture Farming Pays.* Dairy Bulletin, 1948. N. C. Dept. of Agr.

——————— *Ladino Clover—Italian Gift to North Carolina Farmers.* Better Crops with Plant Food, Nov., 1948.

——————— *Sow Ladino Clover.* Progressive Farmer, Aug., 1948.

——————— and Bennett, H. W. *Grasslands in the South.* 1948 Yearbook of Agriculture, pp. 455-462.

Moore, E. L. and Lucas, G. B. *Blackshank, the King of Tobacco Diseases.* Progressive Farmer, Nov., 1948.

McPherson, W. W., Pierce, W. H., and Greene, R. E. L. *Production Practices and Production Rates, Principal Enterprises on Cotton Farms, Southern Piedmont, North Carolina.* Progress Report. AE-Information Series No. 19, Nov., 1948.

Nelson, W. L. *New Possibilities in Production of Cotton Through Adequate Fertilization.* Victory Farm Forum, 32:14-15, 1948.

Niswonger, H. R. and Gardner, M. E. *Bunch Grape Culture.* Ext. Circ. 311, Feb., 1948.

——————— and Williams, C. F. *Muscadine Grape Culture.* Ext. Circ. 306, Jan., 1948.

Pierce, Walter H. *Cost of Producing Turkeys, Anson and Union Counties, North Carolina.* Progress Report. AE-Information Series No. 18, Sept., 1948.

Rankin, W. H. *Fertilizers for Small Grains.* Fertilizer Bulletin. N. C. Dept. of Agr., 1948.

——————— *Five Steps to Success in Small Grain Production.* Farm Forum, No. 33, Dec., 1948.

Roberts, W. M. *Good Housekeeping—An Essential of Modern Dairy Plant Operation,* Milk Plant Monthly, Oct., 1948.

——————— *Quality Milk Production.* North Carolina Dairy Bulletin, p. 11, 1948.

Speck, Marvin L., *The Significanee of Certain Bacteria in Pasteurized Milk.* Milk Plant Monthly, Feb., 1948.

Teter, N. C. and Weaver, J. W., Jr. *Artificial Drying of Peanuts.* The Peanut Journal and Nut World, May, 1948.

Tucker, Henry *Livestock Marketed Through the Old Union Stockyards in Spokane.* Timely Economic Information for Washington Farmers, 58:13-16, May, 1948.

Waugh, R. K. *Feeding Young Dairy Calves,* Carolina Farmer, April, 1948.

——————— *How to Make Good Silage.* The Progressive Farmer, Aug., 1948.

——————— *Pastures and Livestock Nutrition.* (with W. J. Peterson) The Progressive Farmer, Oct., 1948.

Weaver, J. W., Jr., Usry, S. H. and Teter, N. C. *New Job for Tobacco Barn,* C.P.&L. Farm News, Summer, 1948.

——————— *An Analysis of Principal Crop Production and Distribution in North Carolina to Determine the Preliminary Requirements and Specifications for a Farm Crop Dryer.* Agr. Eng. Info. Cir. No. 2, March, 1948.

Woodhouse, W. W., Jr. *Growing Alfalfa in North Carolina.* Better Crops with Plant Food. XXXII No. 7, p. 6, 1948.

——————— and Dobson, S. H. *Producing Pastures and Hay in North Carolina.* Agr. Ext. Cir. 323. Aug., 1948.

——————— and Blaser, R. E. *This is Our Unfinished Business.* 1948 Yearbook of Agriculture, pp. 472-476.

——————— *You Can Have Alfalfa.* The Progressive Farmer, July, 1948.

FINANCIAL REPORT

of the

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION

For the Year Ended June 30, 1948

CERTIFICATION

We, the undersigned, certify that the receipts and expenditures shown in this report from Federal funds and as offset to Bankhead-Jones funds are correct; that the expenditures were solely for the purposes set forth in the acts of Congress approved March 2, 1887 (Hatch), March 16, 1906 (Adams), February 24, 1925 (Purnell), May 16, 1928 (Hawaii), February 23, 1929 (Alaska), March 4, 1931 (Puerto Rico), June 29, 1935 (Bankhead-Jones, Title I), June 20, 1936 (Alaska), and March 4, 1940 (Employer Contributions to Retirement); that the expenditures are in accordance with the terms of said acts so far as applicable to this station; and that properly approved vouchers are on file for all expenditures.

We further certify that the sum of $(None) was the total amount earned as interest on the deposit of Hatch, Adams, Purnell, and Bankhead-Jones funds and that this amount has been remitted to the Treasurer of the United States through the United States Department of Agriculture.

(Signed) J. H. Hilton,
Director of Experiment Station

(Signed) J. G. Vann,
(Legal Custodian of Federal Funds)
Assistant Controller
North Carolina State College of
Agriculture and Engineering

(Seal of Institution)

Receipts and Expenditures

Under Hatch, Adams, Purnell, and Bankhead-Jones Acts, and the State Offset Required by the Bankhead-Jones Act

Fiscal Year ended June 30, 1948

RECEIPTS

FEDERAL FUNDS:	Balance From 1947-48	Receipts From U. S. Treasury	Total
Hatch	$ None	$ 15,000.00	$ 15,000.00
Adams	None	15,000.00	15,000.00
Purnell	None	60,000.00	60,000.00
Bankhead-Jones	None	114,926.05	114,926.05
Research & Marketing Sections 9(b)1 and 9(b)2	None	72,509.04	72,509.04
For Bankhead-Jones and Research and Mktg., 9(b)1 and 9(b)2, Offsets			748,732.86

EXPENDITURES

Purpose	FUND				
	Hatch	Adams	Purnell	Bankhead-Jones	Res. and Mktg. 9(b)1-9(b)2
Personal Services:					
Administration	$9,709.60				
For all other purposes		11,853.68	46,765.32	84,000.87	30,733.02
Travel	973.74	44.39	5,080.52	4,365.27	1,791.70
Transportation of Things	22.59		15.00	347.60	101.22
Communication Service	124.53		296.98	402.63	316.60
Rents and Utility Services:					
Heat, light, power, water, gas, electricity			14.01	108.84	25.09
Rent of land				106.02	
Printing and Binding					
Printing publications	873.21		3.50	39.75	37.90
Other printing and binding	234.97		97.25	242.44	
Other Contractual Services:					
Repairs and alterations to equipment, and other contractural services not otherwise classified	379.70	14.00	568.68	4,050.33	2,555.22
Supplies and Materials:					
Other supplies and materials	2,163.73	734.18	4,348.81	10,613.54	4,679.90
Equipment	517.93	2,353.75	2,690.93	10,594.76	14,966.57
Buildings (capital improvements, including purchase, erection repair, and alteration, and fixed equipment)					1,312.00
Other structures (purchase, construction, and repair)			119.00		
TOTAL EXPENDITURES	15,000.00	15,000.00	60,000.00	114,926.05	56,519.22
Unexpended Balances June 30, 1948	None	None	None	None	15,989.82

Non-Federal Funds

Fiscal Year Ended June 30, 1948

Funds Available

	For All Purposes	For Agricultural Investigotians
State appropriations or allotments	$649,639.54	$628,130.22
Sales	77.655.06	77,655.06
Miscellaneous (Commercial Gifts)	42,947.58	42,947.58
TOTAL	770,242.18	748,732.86

Classification of Expenditures For Agricultural Investigations

Personal Services	$ 436,083.33
Travel	20,641.08
Transportation of Things	3,337.70
Communication Service	5,057.41
Rents and Utility Services	8,327.86
Printing and Binding	9,656.92
Other Contractual Services	32,425.91
Supplies and Materials	94,891.40
Equipment	95,507.15
Lands and Structures (Contractual)	42,804.10
Total Expenditures	748,732.86
Unexpended Balance	None
Total Funds Available	748,732.86